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THE AMERICAN GAS LIGHT JOURNAL

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[OFFICIAL NOTICE.]

Twelfth Annual Meeting Western Gas Association.

SECRETARY'S OFFICE, WESTERN GAS ASSOCIATION,
QUINCY, ILLS., April 18, 1889.

The Twelfth Annual Meeting of the Western Gas Association will be held at Cincinnati, Ohio, on the 15th, 16th and 17th days of May. The "Grand" which has been secured by the local Committee of Arrangements for our headquarters, has been lately refitted, as well as greatly improved in all respects, and is now one of the finest hotels in the country. The business sessions of the Association will be conducted in a large room within the hotel building, and for quiet, comfort and coziness, the arrangement is all that could be desired. The hotel rates have been reduced to $3 per day to the members of the Western Gas Association and their guests.

A reduction in transportation rates has also been secured, for those who will be in attendance, in the territory of the Central Traffic Association, which is bounded on the East by Pittsburgh, Buffalo and Toronto; on the North by the line of, and including points on the Grand Trunk Railway, from Toronto to Port Huron, thence via Lakes Huron and Michigan to the North line of Cook County, Illinois; on the West, by the West line of Cook County and the Illinois and Mississippi rivers to Cairo, including Burlington, Keokuk, Quincy, Hannibal and St. Louis; and on the South by the Ohio river. Not later than two weeks before the date of our meeting, the Secretary will mail to every member (and to those who will kindly inform him of their intention of joining our Association) the necessary information as to how the reduction in railway fares can be obtained.

I am gratified to be in position, owing to the courtesy and promptness with which the contributors of papers have responded to my appeal for the titles of their papers, to present the following index to the literary treat that is in store for the members. The list is appended:

"Meter Accounting: Do I lose any Meters?" by G. A. Hyde, Jr.

"On the Use of Crude Oil for Firing Bench Furnaces and Enriching Coal Gas," by J. H. Woodmansee.

"Incandescent Gas Lighting," by John McIlhenny.

"Inclined Retorts," by R. D. Walsh.

"Retort House Work," by Geo. T. Thompson.

"Retort Furnaces for Burning Coal," by K. M. Mitchell.

"Fuel Gas," by Chas. R. Faben, Jr.

In addition to the above alluring array of subjects, our gifted Honorary Member, Prof. T. C. Mendenhall, of Terre Haute, Ind., has kindly consented to favor us with a lecture on the "Nature of Light." As the members of our Association ardently desire to absorb all the information that there is to be had on this very subject, it is safe to promise the genial Professor an attentive audience.

At the Chicago meeting of our Association, as those who were present may remember, the Secretary was instructed to have all the papers which are to be presented on the occasion of our Cincinnati reunion, printed in advance of the date of that meeting. Now, this the Secretary is very willing to do; but it rests entirely with the authors of the aforesaid papers as to whether or not he is given an opportunity of carrying out the wishes of the Association in this matter. The manuscripts should

reach me by the 25th of the current month, that I may be allowed ample time to revise the proofs, and not to have to "rush" the work. The Secretary devoutly hopes that those of our members who have so kindly agreed to contribute to the literary part of our entertainment, will go a step farther, and see to it that their essays have been duly forwarded to the undersigned not later than the date above mentioned.

Copies of our by-laws, containing our membership list and application blanks for those who wish to swell the ranks of the "Western," will be mailed by the Secretary to those who desire them.

Acting upon suggestions of Mr. Stout, the following gentlemen—*i. e.*, Messrs. Stout, Hicks, Dickey, Stratton and Persons—met in Chicago, April 6th, 1889, to arrange for the members of the Western Gas Association to meet in Chicago and go to Cincinnati in a body. The Committee are perfecting arrangements to go in a special car or cars, to leave Chicago on the evening of May 13th, 1889, and ask all of our friends to join us in making the trip a pleasant one. Notice of final arrangements and route selected will be published in the next issue of the JOURNAL. The local Committee will take pleasure in securing berths for any members who desire to leave Chicago, Tuesday evening, May 14th, 1889.

Any persons desiring to join the party will confer a favor by corresponding with the Secretary of the Committee (FRED R. PERSONS, 75 North Clinton street, Chicago), at an early date.

A. W. LITTLETON, Secretary.

[OFFICIAL NOTICE.]

In the Matter of Standard Meter Unions.

THE AMERICAN GAS LIGHT ASSOCIATION,
OFFICE OF THE SECRETARY,
LAWRENCE, MASS., April 15, 1889.

To the Members of the Association:

Gentlemen—I am informed by the Chairman of the Committee on Standard Meter Couplings that the meter manufacturers, having received the standard union gauges, are now prepared to furnish gas companies with meters having the standard meter unions, in accordance with the report made to the Association at the Toronto meeting, of the following sizes, namely, three, five and ten lights.

Parties ordering meters should remember that if they desire to have the manufacturers furnish meters with the standard couplings they should state it in their orders, otherwise the couplings which have heretofore been in use by the different makers will be sent.

Meters having the standard couplings will have the letter "S" stamped on the coupling and tail-piece.

Yours respectfully, C. J. R. HUMPHREYS, Secretary.

BRIEFLY TOLD.

OUR CURRENT OFFICIAL CIRCULARS.—We must again refer to the cleverness and activity of the gentlemen in charge of the preliminaries of the meeting of the Western Association, who continue their pleasant practice of springing an additional prospective reason for journeying to Cincinnati next month. Secretary Littleton and the committee certainly have arranged it well when the members are to have headquarters and meeting room under the roof of one of the best managed and equipped hotels in the bounding West. The further suggestion that a party be made up from the delegates going by way of Chicago, so that the added comfort and sociableness of journeying in a special car or cars to the place of meeting may be enjoyed, is of a parity with the other tintings that go to make up a harmonious advance coloring. The special committee having this matter in charge are adepts in arranging for railway transportation, not to mention anything about their especial fitness in preparing for living by the way. Those who have volunteered to read papers may be trusted to heed the admonition or warning sounded by the Secretary over the necessity of sending in their MSS. at an hour sufficiently early to enable that painstaking gentleman to carry out the wishes of the Association, as expressed in its ballot of a year ago, to have the papers printed in advance of the meeting. The outlook for a grand gathering grows rosier every day.

STANDARD METER UNIONS.—Secretary Humphreys' circular also gives warning note of another good work accomplished through the agency of the American Association. Much discontent had long existed because of the varying standards of the different meter manufacturers, and the repeated expression of this discontent may now be hushed forever. And it may be said that the formulation of a standard like this which now becomes effective goes far in sustaining any praise that has ever been bestowed upon the influence for good, on the business of the gas manufacturer, of our gas Associations. In this evolution of order from chaos the part taken by the meter manufacturers themselves should not be lost sight of; for, individually, they are to receive the least return from the practice instituted. And this puts us in mind of our suggestion of last November that the members of the Committee on meter couplings ought to be reimbursed by the Association for every expenditure connected with the prosecution of the task set them.

A RARE SURPRISE AT A GOOD ONE'S BIRTHDAY.—"Some men have birthdays, and speak of them; few men have birthdays and keep quiet about them; while other men have their birthdays thrust upon them. In the latter list must be placed the genial meter man, Wm. Wallace Goodwin, who, in touching the LVI. milestone on the turnpike of life, had a realizing sense of the fact thrust upon him by his family. The festive event took place on the 13th inst., at his delightful country seat, at Bordentown, N. J., where Mrs. Goodwin and her boys, aided and abetted by some 'boys of larger growth,' arranged to celebrate the day by a surprise to the husband and friend in the shape of a jolly dinner party. This, too, was one of the surprises that didn't flash in the pan, as it were, but became a genuine surprise; for the sight of his parlor full of gas men and neighbors as the victim entered his house, took away his breath so completely that he did not recover enough of it to talk with for three hours. Now, we submit that when 'Goodie' is 'knocked quiet' *he is surprised* clear through. The youngest hopeful of the family put it concisely when he assured your scribe that the occasion 'just knocked Pa silly.' The creature comforts were most liberally provided, and a dinner—with appropriate trimmings, both wet and dry—that lasted far into the night made Chief Park burst into poetry, as he touched Major McCauley's glass and said:

"'This looks perfectly regal,
For it's warm, and I feel dry—
I am confident that I feel dry.'

The Mayor and Postmaster of Bordentown held up the official dignity of that ancient borough, while the two sad sea-dogs, who had 'sailed the seas over and fit into the war' with Goodwin on 'the old Bienville'—Chief Engineer Wright and John Carroll—made life wretched for Capt. White, who sat between the twain. The historic Philadelphia lawyer was on hand in the person of Squire Felton, who brought with him, that his Attic wit might be flavored with the saltiness of time, the great brewer king of Philadelphia, Mr. Massey, who bore his crown of 80 years so jauntily that the sombre and busy Secretary Jones kept bubbling over with smiles and upsetting his wine glasses. Three chips of the old Goodwin block graced the lower end of the table, and made no end of fun and havoc among 'the wittles,' while 'Uncle Si' failed to keep them in order and would insist on ignoring his own dyspepsia. I nearly forgot to report that a string band, that had the happy fortune to have forgotten its music case in the hurry, made the evening melodious with tunes of easy measure. The staid members of the party insisted on joining the band, when jig tunes were on tap, and 'Marching Through Georgia' brought out all the wearers of army buttons in a discordant howling they blandly called singing. Freedom from arrest being guaranteed by Mayor Hudson, the whole party accompanied the band, and some weaklings like Park and McCauley, to the railroad station about midnight, and then returned to emulate Jack Sprat and wife in trying to lick the platter dry—but larder and cellar held out. It was a great day for Goodwin, and will be remembered by all who assisted, and who heartily joined Mr. Felton in his remarks accompanying the presentation of some solid silver tokens of the day, and in wishing the recipient health, peace and prosperity 'through all the circle of the coming year.'—W."

THE CLEVELAND (O.) GAS COMPANY NOT SOLD.—Despite the most positive assertions that control in the Cleveland Gas Light and Coke Company had passed into the hands of new proprietors, and which statements were credited as truthful by us, we have unalloyed pleasure in now denying the veracity of these assertions. The Company is still controlled by those whose efficient management placed it on the high business plane that it now occupies. Long may it continue to be ruled by the same controllers.

AT the annual meeting of the Chuctanunda Gas Light Company, Amsterdam, N. Y., the following Directors were chosen: Hon. Stephen Sanford, J. Kellogg, D. W. Shuler, John McClumpha, J. K. Stewart, David Cady, and David Cassidy. A dividend of 5 per cent. was declared out of the earnings. The year's business was most satisfactory, the increase in sendout over that of 1887 having been close to 13 per cent.

THE bill, introduced in the Ohio Senate by Mr. Rathbone, requiring that when the agent of a gas company has read a gas meter a copy of the reading must be handed the consumer, has passed the Senate.

THE Committee on Public Lighting, Macon, Ga., will receive bids for the lighting of that city, up to noon of May 1. Gas and electric proposals are asked for, and the contract is to be made for a period of 5 years.

[A Paper read before the Society of Gas Lighting.]

Cooking and Heating by Gas.

By Jos. R. Thomas, C.E.

A short time ago General Hickenlooper, President of the Cincinnati Gas Company, brought prominently to the notice of the resident architects and builders the desirableness of placing in buildings, while in course of erection, not only all pipes and fittings, but also the appliances for utilizing illuminating gas as an agent for cooking and heating. Were the advice then given strictly followed out and the appliances placed as recommended, the result in the near future would be a large increase in gas sales in that city. The course pursued by the General in thus calling attention to this subject is not alone very commendable, but also might be profitably followed by the executives of all other gas companies.

The proper time for placing gas cooking and heating appliances would certainly seem to be when the building to contain them is progressing to completion; for it is obvious that by attending to that work at this time it can not only be accomplished much more satisfactorily, but also at less cost than if the fitting-up is the result of an after-thought. Is it not plain that, when such appliances are not in the finished structure, and so have to be installed when the buildings are completed and possibly occupied, the insertion of the necessary piping is troublesome and annoying to the occupant? Under such conditions floors have to be taken up, casings, etc., removed, and tiled hearths frequently disturbed so that the necessary connections may be made and placed. The trouble and vexation so caused—partly real, although hardly as great as that anticipated—deter many from having their houses arranged for gas, who would, were it otherwise, or with the premises fitted properly at the outset, gladly avail themselves of the opportunity to use gaseous fuel.

Almost all of our modern houses are fitted with open fireplaces intended for grate fires, but the installation is usually arranged for the employment of any of the prime solid fuels—wood, anthracite or bituminous coal. As it is well known, none of these commodities are very low in price, and the opportunity is thus offered of competing with them successfully by means of gaseous fuel. What better way can be found to secure this result than by first bringing its many advantages prominently before the public, clinching the introduction by proving that it is not only advantageous but economical.

The annoyances that precede and follow the use of solid fuels are very pronounced, and the banishment of the vexation caused by their presence will more than compensate for any presumed apparent saving in expense to be realized from their employment. Dirt and ashes have to be removed, and although the operation be attended to as carefully as may be, it is impossible to complete it without generating a dust-cloud that later on spreads itself over the room and its furnishings, to the injury of both. This nuisance alone, of the many caused by solid fuels, is a serious one. Therefore, were the many advantages obtainable by the substitution of gaseous for other fuels properly and forcefully brought out, coal, wood, ashes and all the discomforts in their train would soon be relegated to their proper domain.

If we consider carefully the merits of gaseous fuel, and the relative superiority it bears to other fuels, little argument is required to convince the most obdurate of its convenience. As to its advantages, of course the cleanliness attending its use is marked and patent, and then we have it always at hand and ready; but one of its most valuable features, when devoted to heating purposes pure and simple, is that by it as much or as little heat can be maintained as may be required, while at the same time it is completely under control. The degree of heat and the rate of consumption can be effected by simply turning on or off the gas supply. On the other hand, when depending upon wood or coal for heating, dust and ashes are not the only things the housekeeper has to contend with. The fuel supply, having been stored, must be reconveyed from its storage place to wherever in the house it is needed; and in doing this walls are frequently battered and damaged, carpets are more or less worn—especially on stairways—by constant tramping; and where many fires are maintained, an additional expense for servants is entailed.

It appears to be a well-settled fact, from its having been so often brought unpleasantly to one's notice, that the furnaces for heating our houses, whether they be of the *bon mot* design or other type of manufacture, have their ups and downs, and "go off into the dumps," very similar to those which occasionally take possession of the kitchen angels. At times like these, when the weather is cold, with the mercury seemingly struggling hard to slip out of the bottom of the thermometer bulb, when of course considerable heat is required for warmth and comfort, it is that the furnace takes on its dumpy mood. This may happen, as it often does, just when we are priding ourselves that everything about the furnace is working smoothly and nicely; but a change comes over the spirit of our dreams, and we are abruptly admonished that the reverse is the case, and our felicitous dream of enjoying a genial heat from the glow of the furnace is rudely dispelled. On these occasions the furnace appears to doubt the purpose for which it was intended—that of furnishing heat to make the home comfortable—since it starts off on quite a different tack, and in fact operates more like a refrigerator than otherwise. Whether this peculiarity arises from "pure cussedness," as Artemus Ward used to observe, or to some inherent defect in its construction, would be hard to determine; nevertheless, the fact remains as stated, as every one using furnaces can substantiate. Under the conditions stated, and at other times as well, when supplemental heat is required in our homes, those in possession of gas heating appliances can cast all care and trouble aside. By the simple act of striking a match to light the gas, the household can in a very short time enjoy the genial heat thus easily procured.

Some of the prime advantages of using gas for fuel purposes are thus exemplified, and there are many others that might be instanced in connection with it; but we think those mentioned are sufficient to convince the most skeptical. With this understanding, no further elaboration may be required in describing the merits of gaseous fuel.

The question, however, is frequently asked, "How will it compare in cost with the others?" The best answer to such query is to practically bring the matter down to dollars and cents. We will suppose a cold room in which heat is required, the means for raising the heat to be a gas grate, the maximum gas consumption of which is 20 cubic feet per hour. Rating the cost of the gas at $1.50 per thousand, the cost of the fuel per hour is just 3 cents; and this, it must be remembered, is the expense for maintaining the gas supply at the maximum of the grate's gas capacity. As the room becomes heated the quantity being consumed can be lessened; hence, during the actual time of heating, the probable actual cost will not exceed 1 or 1½ cents per hour.

When used for cooking purposes 50 cubic feet of gas will easily cook a dinner for 15 or 20 people. At the price above named this will cost 7½ cents. Twenty cubic feet of gas will as readily cook a dinner for 6 or 8 persons, and the cost of the operation will be just 3 cents—in fact we have known of a breakfast that was prepared for 4 people, the cost of the gas used being but a little in excess of 2 cents. It is obvious that cleanliness and convenience are assured by gaseous fuel; and the figures of cost, as instanced above, either for cooking or heating, prove its economy. It is safe to assume were the gas that is now manufactured freely utilized for cooking purposes, its cost would not exceed one-half that now paid for the solid fuels employed to a great extent to accomplish the same purpose.

Many honest and inquiring minds are now engaged in attempts to solve the problem of how to produce a cheap and efficient fuel gas, and much time and research are being devoted to the subject. To these students we would say, keep right on in your endeavor to produce a fuel gas that will prove satisfactory under all its conditions. Should you not be successful in obtaining all you are striving for, you will undoubtedly gather much knowledge and experience in the undertaking which will be valuable in the future; but at the same time while you are doing this it will also be well to try in every manner to introduce as a cooking and heating agent the gas you are now manufacturing. It is a well known fact that the fuel gases now enjoying the greatest share of favor will not compare in their heating properties with that supplied for illuminating purposes; therefore it is more advisable to do all you can with what you now have until something of better quality be found that will supersede it for furnishing heat with greater economy.

Notes on Scurfing Retorts.

By Henry Sainsbury.

[Read by the author at the Bridgewater meeting of the Southwest of England District Association of Gas Managers. Reprinted from the London *Journal*.]

It was suggested at our last autumn meeting that, failing any promise of papers for to-day, the Committee should indicate a few subjects for discussion; and some three or four were named in the printed record of the proceedings at the Weston-super-Mare meeting of last year as being suitable for our consideration. With the understanding that I was only to give a few "Notes" of my experience on the above subject, and not a finished and exhaustive paper, I have c ented to introduce it to you to-day.

There are, no doubt, various means adopted for the prevention and removal of the troublesome deposit on retorts. I do not profess acquain-

taince with them all, and will only speak of those in use at my own works; trusting it may be the means of bringing out from the members present a greater variety of plans, and more effective in their results.

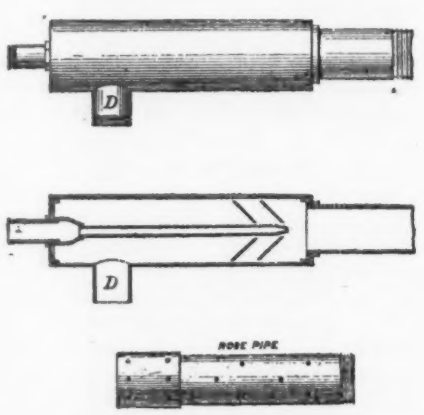
A word as to "prevention." Some managers, by the use of the anti-dip in its many forms, claim to dispense with scurfing altogether; but having never ventured on these—to my mind—dangerous experiments, carbon still is found on our retorts. We have lately, by the means of divided hydraulic mains in short sections, with separate tar valves to each section (whereby the dip in each case can be kept to the lowest possible seal), found the deposit very greatly reduced, and the make of gas increased per ton of coal carbonized.

Retort-scurfing, in my experience, divides itself into the orthodox first, second, and third. First, the old-fashioned method of 30 years ago, when the retorts were left to burn off the carbon by keeping the lid slack, and, when a little loose, prizing it from the sides with a long chisel bar, or punching it off the back with the same instrument. The time of full moon, when the lamps were not lighted, or when a fresh bed of retorts was charged, were occasions eagerly taken advantage of for this purpose; and many a time a man would work away for a day or two at one retort, endangering the sides in prising off the carbon, or shaking the walls in punching the back ends. As soon as the stock of gas began to run down, some of the retorts would be charged again with perhaps 5 or 6 inches of carbon at the back; the sides having been hurriedly cleaned. I really believe there were some retorts never thoroughly cleaned from the first deposit till they were taken out for removal and renewal. Occasionally a piece of old 1½ or 2 inch wrought iron pipe was roughly built into the mouthpiece of the retort, the pipe reaching nearly to the back end, and the top cup of the ascension pipe taken off to act as a chimney. The air drawn in through the pipe would, after a time, burn out a hole in the scurfing at the back, and enable it to be cleaned. This, however, was a work of time.

These were my early experiences of retort scurfing; but better plans were being adopted, especially by those who could get easy access to the back of the benches. When visiting the Frome gas works I noticed how they cleaned their retorts, and more particularly as to the backs. A hole about 5 or 6 inches in diameter was made in the back stopper, and a pipe carried from it through the back wall to the outside, ending with a screw, clip, and cover. I need scarcely describe the method of scurfing by this arrangement, as it is well known to most of you, and I suppose universally practiced where it is possible. When a retort requires scurfing the back cap is taken off, and a hole knocked through the carbon for the admission of air. A luted lid is placed over the mouthpiece, and the top cap removed from the ascension pipe. Care must be taken to see that it is not choked, as it forms a chimney and draws the air through the retort, burning off the carbon, or so loosening it that it readily gives way to a gentle pressure from the iron bar. A cast iron air-spreader is pushed into the end of the pipe from the retort, which prevents the air from drawing directly through the retort to the ascension pipe, and causes the air to pass over the back, and so burn the carbon off the most difficult part to be cleaned. I have found in practice that these spreaders quickly burn away; so I have had recourse to a piece of old retort or fire-tile, which, being placed in front of the air pipe, accomplished the same purpose. When neither of these was available, I have found three or four square bricks, put one on the other, answers in the same way. This plan is simple and effectual; and we shall always use it when it can possibly be done. I have found that the direction in which the wind is blowing will hinder, or otherwise facilitate, the work. I usually find that a retort not very badly scurfed can be cleaned in 12 hours with a judicious use of the bar.

About three years ago I had occasion to re-arrange some of our benches, and place them back to back; so that 7 beds out of our 13 cannot be cleaned by the method just described. What must be done? The retorts would scurf; and if no better plan was found, we must go back to the inefficient system of our early experience. On thinking the matter over, I remembered reading a paper by Mr. S. Rutter, of the Uxbridge gas works, in the Appendix to the Transactions of the Gas Institute for 1882, on "The Deposit of Carbon on Retorts, and its Removal." I carefully read this paper again; and as the plan proposed was simple and inexpensive, I determined to give it a trial. In connection with his paper he gives a drawing of the apparatus employed, a copy of which is now before you (see cut). The following is Mr. Rutter's description of his method:

"I do not claim quite a new idea in my mode, but at the same time I do not think anyone else has ever tried the same kind of apparatus. It consists of a cylinder 3 inches in diameter and 12 inches long, having at one end a piece of ½-inch tubing for a steam inlet, which is continued by a ¼-inch brass tube (diminished at the end to $\frac{1}{16}$ inch jet) through to within an inch of the other end of the cylinder, where the outlet should not be less than 2 inches. Beneath the cylinder, within about 1½ inches from the end admitting steam, is a 1½-inch air inlet, marked *D* on the drawing. The steam rushes out of the nose piece, draws in air at the aperture *D*, and drives it along the pipe to the end of the retort, and the



mixture is distributed by means of a rose pipe over the carbon, which it breaks up without injuring the retorts. It is on the same principle as the first steam-jet exhauster, and is, with regard to its construction, a large Bunsen burner, which can be seen by a glance at the drawing. The holes in the rose pipe, which extends to the end of the retort, are ¼ inch, spaced 3 inches apart in three rows, one on the top and one on each side, excepting about 18 inches from the connecting end, and at the other there is a cap with three or four holes in it also. The blower is so simple that it can be made by any blacksmith or tinsmith for a few shillings. Of course, in retort houses of great length several blowers could be used at the same time."

Mr. Rutter's experience of the use of this apparatus you can read for yourselves in the Transactions of the Institute. I will now give you mine. I had the blower and pipe made in every way as described above, but found it necessary, after a little experience, to make a slight alteration in the rose pipe. I found, while the rose pipe helped the cleaning of the sides of the retorts excellently, the cleaning of the back ends was a slow process. The back of the retorts was our principal difficulty, as the sides would soon go when the back was cleaned. I therefore substituted a pipe without holes instead of the rose pipe, and left the end full open instead of the cap with holes. I find this soon burns a hole in the carbon wherever it is placed. If the retort is large we move it from the center to the sides, and so get the back quite clean. When this is done, what little remains on the sides is quickly removed by the bar.

With the aid of this blower and pipe we clean a retort after a month's work in six hours—that is, only losing one charge. The retort is not injured by constant punching; and a man will not be more than two hours attending to it altogether. Having a fair amount of boiler power, we find no difficulty in keeping two boilers at work without interfering with the speed of the engine and exhauster. We bring our steam to the front of the retorts in a different manner to that described by Mr. Rutter in his paper; but every manager will arrange that as it may best suit his own works. In our case a ¾-inch steam pipe is brought from the boiler, and runs along and rests upon the principals of the roof just over the front of the retort beds. We find that one pipe will work for three beds. A steam swivel joint is inserted in the pipe at the center of the three beds, which allows a ¾-inch pipe to be pushed up into the roof or brought down to the retorts. Another swivel is attached to the end of this pipe, which allows the second pipe (the one connected to the blower) to move the distance between the farthest retorts on either side of the center. By this means you can with one pipe clean the top or bottom retorts in either of the three beds; the width embraced being about 20 feet. I find the 2-inch pipe used for the air pipe to the back will usually clean some four or five retorts before it is entirely destroyed. I do not use new pipes; but old ones we may have in stock, or that I may be able to purchase at old-iron price.

Discussion.

Mr. W. Davis (Poole) did not think he could add much to what had been said in the paper; but he considered that the apparatus described and the manner of working was a great improvement on the method hitherto in general use. For some considerable time it had been his practice to clean the retorts by means of a piece of old 3-inch or 4-inch

pipe, introduced through a hole in the lid and extending nearly to the back, the cap being removed from the top of the ascension pipe in order to create a draught. The air passed in through the pipe to the top of the retort, and traveled forward to the front, burning off the carbon. A little sight-hole, closed by a plug or hinged cover, was made in the lid to admit of seeing how the cleaning was progressing from time to time. Unfortunately the piece of pipe would only last out one retort before melting. Some years ago when he used lime for purification, he had made it a practice to fill the retort with limestone so as to prepare some lime while it was standing off for cleaning; and he believed this plan facilitated the removal of the carbon. No doubt in large works where through retorts were in use, these appliances were not found to be necessary, as a current of air through the retort was readily secured by leaving the lid loose at one end, and taking the cap off the ascension pipe at the other.

Mr. T. W. R. White (Sherborne) thought it would have been well if the discussion on the two papers they had heard had been taken together, as the subject of carbon in the retorts was closely allied to that of the hydraulic arrangements. It was all very well to discuss plans for the removal of carbon, but he believed that "prevention was better than cure;" and the thing to be considered was how to reduce the formation as much as possible. This was one advantage that followed from the use of the separate sections of hydraulic, which admitted of the seal being reduced. Engineers of gas works should take care to get retorts that were as impervious as possible. The deposit formed quicker on rough surfaces than on smooth ones; and more than that, it adhered more tenaciously to the former than to the latter. He applied a coat of liquid cement to the inside of his retorts, with a view of rendering the surface smooth and less porous, before using them. No doubt Mr. Sainsbury had introduced a useful apparatus; but with separate hydraulics to each bed, and the other precaution he had named, the formation of carbon was very slow and easily disposed of.

Mr. E. C. Riley (Swindon) said he had lately given considerable attention to the formation and removal of carbon in retorts. He found that at small works where there was no exhauster the accumulation of carbon was very rapid, especially at the back ends; and, of course, at works where there was an exhauster they were not free from it. In a very small works he knew of, a bed of twos had been destroyed in six months entirely by the use of the scurfing-bar. Referring to "King's Treatise" for information on the subject, he found that the use of high-pressure steam was recommended, and he accordingly made an apparatus very similar to that described by Mr. Sainsbury. Having fixed the injector in a retort so that the end of the pipe came within a foot of the back end, he added a screen or baffle of brick to direct the current against the sides and back of the retort and to disperse the steam. The steam nozzle was about ¼-inch in diameter, and he allowed a current of steam varying from 90 to 135 pounds per square inch pressure to act for about two hours. At the end of that time scarcely any effect was perceptible, and the steam pressure was increased to 140 pounds. He then tried the old plan of placing the lid a little slack, and taking the cap off the top of the ascension-pipe, and the difference between the efficiency of the old plan and that of the new was barely distinguishable. He was greatly taken with the idea of having the air-pipe at the back of the retort; but, unfortunately, it happened that at many of the works under his care it was absolutely impossible to get at the back ends. The retorts were set close back against walls on rising ground.

Mr. J. J. Jervis (New Swindon) remarked that he understood the air and not the steam was the active agent in removing the carbon, and he would be glad to hear Mr. Humphry's opinion on that point.

Mr. N. H. Humphrys (Salisbury) said that the steam could only act as an agent for increasing the draught of air which was necessary to combustion. The carbon in the retort was burnt up in just the same manner as carbonaceous fuel was burnt in a grate. The use of any considerable quantity of steam must result in loss of heat, since the specific heat of steam was very high. Perhaps Mr. Riley used such an excess of steam—for a large quantity of steam would rush out under the pressure named—that the temperature in the retort was reduced below that at which combustion would obtain. Carbon in retorts might be compared to anthracite coal, which was a dense form of fuel, and required a high heat and good draught to burn it in a grate.

Mr. H. F. Vincent (Frome) considered that the steam was a hindrance and deterioration to the air rather than otherwise. He used the plan mentioned in the paper, of having an air-pipe at the back of each retort, and could clean the dirtiest retort in 12 to 18 hours without steam.

Mr. T. Hardick (Salisbury) said that at Salisbury they used the same plan, and successfully, to his belief, though he now left all these details to Mr. Humphrys. No question ever arose as to difficulty in cleaning the retorts.

Mr. Sainsbury, in reply, said he had tried the plan of burning lime in the retorts, referred to by Mr. Davis. He did not quite follow the point raised by Mr. White. They all found that the retorts got dirty, whether slow or fast; and therefore it could not but be advantageous to talk over the best way of taking off the carbon. He did not use any baffle, but allowed the steam to play straight at the back of the retort. Possibly the high pressure of steam used by Mr. Riley caused the retort to be filled principally with steam, so that but little air could get in.

The President observed that he had listened to the discussion with pleasure, but must admit that he preferred the old plan, and used the scurfing-bars, although he had known retorts to be broken. He considered the burning process a very slow one indeed.

Keeping Gas Companies' Accounts.

By W. A. Hastings.

[This following paper received the first prize in Series IX. of the prize competition instituted by the *Gas and Water Review*.]

The simplest as well as the most complete form of accounts now in use by gas companies is that prescribed by the Gas Works Clauses Act, 1871, which is binding on all gas companies subject either to that Act or the Gas Works Clauses Act, 1847. This, however, does not apply to local authorities possessing gas undertakings.

In considering the practice of keeping the accounts in the form prescribed, it will be advantageous to divide the books in use into two groups, and to treat each group separately. The first group will consist of the books in every-day use, and in which the consumer's relation to the company is defined; the second group will be those from which the balance sheet is directly prepared, and which on that account are chiefly interesting to the shareholders.

First Group.—The first book that demands attention—the primer, so to speak, of a gas company—is the Meter Inspecting Book, in which the quarterly indices are entered by the Inspector. The form now generally in use is ruled with five columns: 1, date; 2, index; 3, quantity consumed; 4, date; 5, index. It will be found an advantage to enter the index at the half-quarter in the fifth column, so as to facilitate the working out of the quantity consumed by bringing the quarterly indices immediately under the preceding quarter in the second column. It need hardly be said that great care is necessary in entering the indices, and even with a trustworthy Inspector it will be advisable for some one to carefully examine each Inspecting Book, and compare the quantity consumed with that of previous years. Any marked increase or decrease should be investigated before the account is rendered, so as to leave no doubt as to its accuracy.

The book that has next to be dealt with is the Gas Rental, or Journal, as it is sometimes called. If the latter, there is, in addition, a Consumers' Ledger, which will be referred to in its proper place. The Gas Rental shows the name and address of each consumer, in the order of streets, the index of his meter at the commencement and end of each quarter, with the quantity consumed and the amount due for gas, and stove and meter rents. In some cases there is a column for arrears to be brought forward from the preceding quarter, and where this plan is followed it will be found useful in showing at a glance the state of the consumer's account without the necessity of referring to previous Rentals. There should also be a column for the total of each consumer's account, and one in which to post the folio of the Cash Receipt Book when the account is paid. The rental will have to be rewritten every quarter, unless it is large enough to take a duplicate set of columns on the second page, when the entry of the consumer's name and address will serve for a half year. One difficulty with regard to this book which has not yet been successfully met is in posting an account when paid in instalments, in which case no better way has suggested itself than in interlining the various folios which go to make up the total amount paid.

The Consumers' Ledger is not, strictly speaking, necessary where the rental is properly kept, but it serves as a convenient book of reference to consumers' accounts. In principle it is similar to an ordinary ledger, each consumer having a debit and credit account, duly indexed, which is posted on one side from the Rental or (as in this case it would be called) the Journal, and on the other side from the Cash Receipt Book. It is invaluable in the case of a disputed account, as it admits of such easy reference to the consumer's previous consumption. The drawback is that, except in the case of a small company, its adoption will necessitate an increase in the staff, as it, of course, involves doing the same work twice—being, in fact, an adaptation of the double entry system.

The Cash Receipt Book has columns for the different items received, such as gas, meter rent, fittings, coke and other residuals, and any miscellaneous receipts, which are posted either into the Gas Rental or the Residual or Fitting Ledgers. The totals of the Cash Receipt Book are transferred periodically to the General Cash Book—the Cash Book proper—which will be treated of in the second group.

The two books next to be considered are the Sales Day Book and the Sales or Residual Ledger, in which sales of coke, tar, etc., old iron, spent oxide, spent lime, and any other miscellaneous items are entered. The Day Book serves to summarise the entries, and the Ledger enables any account to be referred to at once in the same manner as the Consumers' Ledger. A Fittings Journal, in which all fitting work done by the company is entered, and a Fittings Ledger, into which it is posted, are also necessary.

The Wages Book is usually ruled with columns headed to correspond with the principal items in the Revenue account. The totals can then be transferred weekly, if desired, to a Summary Wages Book, so as to expedite matters at the end of the half year. This is also an advantage to the Manager, who can the more easily compare one week with another, and see where retrenchment is needed.

This completes the list of books comprised in the first group. There are a few minor books which will be found necessary in practice, but as these vary considerably in different localities, and do not affect the general working of the system, any further reference to them is not needed here.

Second Group.—The Cash Book is a record of all moneys received and expended, however insignificant the amount, the larger items being entered direct, and the amounts received for gas, residuals, etc., periodically, in one sum. Moneys withdrawn from and paid into bank must also be shown in this book. It is usual to supplement it by a Petty Cash Book, from which the total expenditure may be transferred half yearly, which will prevent the Cash Book being filled up with trivial details. The balance struck at any time should agree with the cash in the office.

The General Ledger may either be one book, or be subdivided into two smaller ones—a Personal and an Impersonal Ledger; the latter form being more convenient for working. In this book not only must accounts be opened for tradesmen, officials and bankers, but every item, both of receipts and expenditure, must have its ledger account. Thus the "Gas Account" must have the totals debited each quarter from the Gas Rental, and the cash credited from the Cash Book, and the balance due at the end of the half year should correspond with the arrears in the Gas Rental, on which it is thus a check.

Next in importance is the Journal, which may be regarded as a summary of the whole, and in which each item in the balance sheet is accounted for, and its source indicated.

An Expenditure Book, though not absolutely necessary, is useful in presenting the expenditure in a dissected form, so that the totals may show the amount expended during the half year. It should be noted that the entries do not apply to actual expenditure, but to liabilities incurred during the period. A Stock Book, the name of which sufficiently explains its character, will complete the list of the second group of books.

It will now be necessary to look at the form of accounts prescribed in Schedule B of the Gas Works Clauses Act, 1871, and to consider what may properly be charged to the different items there specified.

The Capital Account shows the amount of share capital received, the amount borrowed on mortgage, and the premiums realized on the sale of new shares, and it accounts for the capital thus raised by showing how much has been expended on the different items of new land, new buildings or machinery connected with manufacture, new mains and services, new meters, and the cost of promoting any special Act of Parliament. The actual amount expended is known as "fixed" capital, and the balance as "floating" capital. It must be borne in mind that the word "new" in the foregoing items applies to extensions only. Thus, if a service pipe becomes worn out, and is replaced by a new one, it is not really a new *service*, and cannot therefore be charged to capital. All buildings, machinery, or fittings erected or used to replace others worn out, are "renewed," and must be charged to the Revenue Account, which is, from a shareholder's point of view at least, the most important part of the balance sheet, for upon it depends the profit for the half year, and consequently the dividends payable. It shows the working expenses and the receipts for gas residuals, etc., and the balance will be the profit made. The item of "coal" must include any coal duty that has to be paid, as well as carriage, haulage, etc. Most of the other items are self-explanatory, but it should be noted that if the Engineer is allowed a fixed sum for rent, that item should properly be included in "rents," and not in his salary. In the next item, "repairs and maintenance of works," if any old materials, such as scrap iron, etc., have been sold during the half year, they must be credited and shown in the Revenue Account. "Salaries of inspectors and clerks in light office, etc.," includes that portion of the staff engaged with the gas rentals, the salaries of secretary, accountant, and the remainder of the staff being grouped under the head of Management. Superannuations and any contributions to workmen's benefit funds must also be paid out of revenue, and the bad debts must also be included. Amounts can only be charged to Depreciation in cases where any portion of the works is erected on leasehold lands, when a certain sum may be set aside, periodically, at the discretion of the Directors, to provide for the loss occasioned by the expiration of the lease. The ordinary depreciation, or wear and tear of plant, is provided for, as has already been explained, out of current expenditure. The balance of the Revenue Account will be the profit made, and this is carried to a Profit and Loss Account, where the undivided profits are also accounted for.

On the debit side of the Profit and Loss Account must be entered any interest paid on mortgage bonds, and temporary loans from bank, the dividends paid for the preceding half year, and any amount carried to the reserve fund, of which mention will be made presently. If interest is paid on consumers' deposits, it must also be shown in this column. On the credit side of the account is entered the profit brought from revenue account, any interest received on money deposited at bank, and any amounts drawn from the reserve fund during the half year. It appears to be a doubtful question whether income tax may properly be charged without deducting it again from the dividends payable. Some companies do so, while others charge it again to the shareholders.

The reserve fund is intended to act on the compensating principle by charging a good half year with the deficiencies of a bad one. Any surplus profit, after paying dividends, may be carried to this fund, which must be invested in securities, and the interest thereon be reinvested. The total amount so invested must not, however, exceed 10 per cent. on the paid up capital. In case the profits are not large enough in any half year to pay the full authorized dividends, the deficiency may be made up from this fund. A reserve fund is quite optional, and the Directors may, if they prefer, carry forward the balance of undivided profit in the Profit and Loss Account until it is eventually used for the same purpose.

An insurance fund is sometimes added to meet any extraordinary claim or demand arising from accident or other causes. It must not amount to more than 5 per cent. on the paid-up capital.

A Statement of Coals, showing the quantity in stock at the commencement and end of the half-year, and the quantities received and used, is necessary, as well as a Statement of Residual Products, giving the same information with the addition of the quantities sold. Some companies add a Statement of Gas Made, Sold, etc., though this is not provided for in the schedule. If this is not done, it will be necessary to insert the quantity of gas sold in the Revenue Account, to enable anyone to analyze the accounts in a satisfactory manner.

The General Balance Sheet contains on the debit side the amounts standing to the credit of capital and profit and loss accounts and reserve, depreciation, and insurance funds, with any other funds that may be open, any dividends and mortgage interest that may remain unpaid, the amounts due to tradesmen for stores, etc., and deposits due to consumers. On the credit side should be entered the cash in office and at banker's, the value of stock on hand, the amounts outstanding in the gas and meter rental, and any other amount due to the Company for residuals, etc. If there is any sum invested either in securities or on deposit at the bank, the amount must also be included, but without interest, and the total should agree with the total of the debit side. The balance sheet will now be in a position to be audited; but in order to compare it with the accounts of other companies it will be necessary to analyze it. This is done by ascertaining the cost of each item, both of income and expenditure, in the revenue account, per 1,000 feet of gas sold, and per ton of coal used. The latter is not so good a criterion as the former (except, perhaps in the case of residuals), as the cost per 1,000 feet sold enables one to judge whether the price of gas may with safety be reduced or not, and it also forms a good standard of comparison with other companies. The most convenient method of showing the analysis will be to have a Statistic Book, starting with the cost of coal, and from it deducting the total value of residuals (the items of which may be shown separately). To this add the working expenses and bad debts, in detail, and the total will be the gross expenditure. This has to be deducted from the income derived from sale of gas, meter rents, fittings, and miscellaneous receipts, and the balance will be the profit as per Revenue Account. The book can be ruled so that opposite each item there is a space for the cost per 1,000 feet sold, and the totals can be carried out in the same way. The practical working of this plan

can now be seen. If the profit for three or four half years averages, say, 13.50d. per 1,000 feet, and the dividends payable absorb, say, 9.50d. per 1,000 feet, the price of gas may, other things being favorable, be reduced 3d. per 1,000 feet, and still leave a sufficient margin to pay full dividends.

In a brief paper like this there are some interesting items that space will not allow to be more than mentioned—such as the action of the sliding scale, and the practice (as well as theory) of charging expenditure to capital or revenue; but enough has been said to illustrate the working of this system of accounts, which will be found in practice to contain all the information necessary to arrive at an accurate valuation of the undertaking, as well as to ascertain the progress of the Company.

Fatal Poisoning by Carbon Monoxide.

Prof. W. P. Mason, of the Rensselaer Polytechnic Institute, contributes the following:

In Troy, N. Y., on January 6, 1887, owing to a break in the street mains, a quantity of fuel gas (see analysis below) passed beneath the frozen crust of earth and found its way into the adjoining houses. Three deaths,* and many more or less serious illnesses, resulted.

The following points, from the testimony of the physicians who made the autopsis are to be noted:

The expressions of the deceased were placid. One victim, an old woman, was found seated in her chair holding her false teeth in her hand. The second, also a woman, lay upon the floor. The third, a man, sat upright on a lounge, his head reclining on his shoulder. The fire was burning in the stove, and the lamps were still burning on the table. When found death had not been very recent, as *rigor mortis* was fully developed.

Very searching autopsis were made, with the result of finding nothing whatever abnormal, with the exception of the bright cherry-red color of the tissues, and the vivid redness and lack of coagula in the blood.

Upon opening the chest cavity the physician bent forward and took one or two long whiffs for the purpose of determining the presence of any odor. Almost immediately he was seized with giddiness and great oppression in the epigastrium, so much so that he had to discontinue his work for half an hour. The effects did not finally wear off until after an interval of about twelve hours.

The painful oppression in the chest, the giddiness and the subsequent headache experienced by this physician, call most forcibly to mind the symptoms described by Sir Humphry Davy when he so rashly experimented upon himself with carbon monoxide.

A lawsuit naturally growing out of these cases of poisoning, I was called upon to give the chemical constituents found in the said fuel gas, and the results are appended. I also experimented upon animal life with carbon monoxide mixed with air, obtaining results confirmatory of observations already made, that death usually takes place very quietly, although occasionally with convulsive movements. Chickens and rats were the two forms of life employed.

Blood, treated with carbon monoxide, I found to assume a bright red, almost carmine, color, which did not alter on exposure to air for a number of days.

Finally, in February, 1888, a bottle of blood taken from the heart of one of the victims at the time of the autopsy, was submitted to me for examination. The bottle was closed with a tight cork. Although over a year old, and possessing strong odor of decomposition, the color still remained of the brilliant, vivid red noted at the time of taking the specimen. Under the microscope but very few corpuscles remained to be seen, their structure having almost completely broken down.

Examination by the spectroscope revealed the two absorption bands near the line, characteristic of the presence of carbon monoxide in combination. These bands, although very like those indicative of oxy-hæmoglobin, may yet be readily distinguished by their location only, particularly if a sample of blood artificially treated with carbon monoxide be at hand for purposes of comparison.

The space between the bands is, moreover, much less clearly lighted than in the case of oxygenated blood. As a confirmatory test, the blood under examination was treated with solid potassium sulphide, and the absorption bands found unchanged thereby—the bands of oxy-hæmoglobin, as is well known, change under such treatment to the single dark band midway between the positions of the former ones.

What is of special interest in this case is the ready detection of carbon monoxide in the blood after so long an interval of time.

*A fourth death (that of Dwight E. Barnes, Jan. 28, 1889) is reported from injuries received at this happening.

At the present moment, nearly two years from the date of the accident, the blood still retains the characteristics noticed when first examined.

The analysis of the fuel gas by volume is:

CO_2	5.0	per cent.
O	0.5	"
CO	37.5	"
CH_4	.9	"
H	48.0	"
N	7.1	"

Such gas supplied to consumers is practically odorless.

(Continued from page 382.)

Gas Engineering Forty Years Ago.

By Geo. Anderson, C.E.

[The fifth of a series of articles in course of publication in the *Gas Engineers' Magazine*.]

One business trip into which I entered with a considerable amount of pleasure was a visit to Athens. I was offered a concession that had been obtained from the Greek authorities for lighting that historic city. This was in the year 1857. I spoke to Mr. John Aird about it, he spoke to Messrs. Cochrane, and the three of us decided to inquire into it; and one of the young Cochranes and I went to Athens. We satisfied ourselves that the project was a good one, but a financial crisis occurred in this country ere the preliminaries were settled, and it fell through.

The history of ancient Greece was a favorite one with me—from the time of Homer to that of the unsuccessful struggle of Lord Byron, who found that, after the dominion of the Turk, "it was Greece, but living Greece no more." Of course we did the acropolis many times, including visits by moonlight—perhaps the most enchanting, though we didn't see "the ghost of freedom stalk;" yet one could not look on those splendid ruins of the Parthenon without seeing that a great people had once lived there. I suppose the first shelter a human being would take to would be a hole in the ground, or the overhanging projection of a cliff, or under a tree. As he advanced he would stick some sticks together, cover them over with leaves or grass, and creep in beneath; and so he would advance step by step, and probably by long intervals, till he arrived at the Parthenon, the Temple of Jupiter, or Thesus. But what a distance lies between the hut of the savage of the present day and the glorious construction of the Greeks of thousands of years ago.

One side of the Parthenon, which resisted the cannon balls of the Turks, is studded in hundreds of places by those balls, showing deep indentations in the splintered marble. All the statuary is gone. I was told that during the occupation by the Turks the statuary was burnt into lime, as they found it to be of the purest marble. I had been able to form some opinion of the Turks on a previous visit to Constantinople in 1854-5—of their worthlessness, of their incapacity to govern, of their utter backwardness compared with European civilization. All this referred to themselves, and was only of a negative character; but the destruction of world-famed temples was a positive act of such a disgraceful kind that it must forever remain a stain on their character.

I do not think I should bring those charges against the Turks at Constantinople without a specification of what I mean. Well, when I was there, though Constantinople is a large city standing in a lovely position on the banks of the Bosphorus, with a vast amount of shipping, there were no graving docks nor any place where a vessel could be laid up to have a bit of copper repaired on its bottom. The houses, which were mostly of wood, had the foundation brought up to the surface in small stones laid in road dirt, although there is a mountain of limestone within a couple of miles on the other side of the Bosphorus, and there is plenty of coal to burn it within 80 miles, or say a 4s. freight up the Black Sea, which coal was being worked by us for our steamers during the war. The land for many miles behind Constantinople is a stiff yellow clay, but I saw no sign of burning it.

When I was there all vessels had to anchor off the city, and be lightered into barges. There were no quays—save one at the Arsenal—though the water was deep almost to the water edge. All goods, when landed from the barges, were slung by ropes and carried by laborers from long poles placed on their shoulders—and the streets were so narrow that two such gangs going in opposite directions could not pass, save at certain spots, so they shouted as they went to prevent meeting at a narrow spot. The streets were paved by rough stones as quarried, laid down anyhow, so that if you stepped on one in wet weather, you ran the risk of having a lot of dirty water squirted up your leg, and in dry weather I was told there were clouds of dust. Every householder

threw all the offal of the previous 24 hours on to the street each night, and thousands of ownerless dogs growled and swore and ate what they could of it. And this didn't take place in bye-streets only, but also in the best streets. There were no street lights save near the Palace—not even oil—so that everyone going out after dark had by law to carry a crude lighted lantern—these lanterns you collapsed, extinguished and laid on the hall table when you entered a house.

I don't think I need call any more witnesses in proof of the character I have given the Turk of 1855 at Constantinople. Of course, while in Athens we went to the Hill of Mars, where Paul preached, and to the place where the gate was inscribed to the unknown God. We saw the caves cut in the living rock, where Socrates is said to have drank the poison. We climbed the mountain of Lycabitus close by, on top of which lived a leper. Lepers are dreadfully shunned; no one will touch them—they have to live apart, though otherwise kindly treated. Instead of throwing him a bit of silver I gave it him and shook him by the hand—it was a horny hand, more like the under side of a dog's paw. His expressive Greek features and dark eyes shone, and I bethought myself—poor solitary soul, I have at least given you a moment's happiness.

We went to the Pentilican marble quarries that supplied marble for building the Parthenon, or Temple of Minerva, as it was called by the ancient Greeks—to the plains of Marathon, and to the Bay of Salonica, where the numerous Persian hordes, under Xerxes, were beaten by the Greeks, 490 years B.C. Thus, though our visit did not result in business, I derived from it a deal of pleasure I can never forget.

Mr. B. H. Thwaite on an English Company's Water Gas Prospectus.

Mr. Thwaite, an English authority who has given much attention to the subject of fuel gas, contributes the following interesting letter to our English contemporary, *Engineering:*

Along with most of my fellow engineers I have seen the remarkable report on "Water Gas," which has during the last week appeared prominently in the daily papers. This report does credit to the enterprise of its originators, and is another proof of the assimilation by Britishers of American ideas.

This letter will merely concern the chemical and thermo-economic statements set forth in this report; *a priori*, I may say, that the remarks I have to make are offered in no hypercritical spirit, but are intended to clear away misconception and arrive at a clear estimate of the value of what is popularly known as water gas—a misnomer, that in one instance led to an amusing inquiry from a person in Algiers, who wrote to me asking if I would provide him with means of making water gas, as, although there was no coal in the neighborhood, there was an ample supply of water.

It is stated in the report that the useful effect in using solid fuel in ordinary circumstances is at the most 20 to 25 per cent., but with gas 90 per cent. of useful efficiency can be attained.

Now, if we take the normal and actual calorimetric value to be equivalent to an evaporation of 14 pounds of water to 1 pound of fuel, the ordinary efficiency of solid fuel firing systems is as follows:

$$\frac{7 \times 100}{14} = 50 \text{ per cent.}$$

The net possible useful efficiency of gas firing, after allowing for the heat required to raise the waste gases up the chimney (a thermodynamic work that cannot be neglected in calculation), is:

$$\frac{10.5 \times 100}{14} = 75 \text{ per cent.}$$

With water gas it is theoretically impossible, without condensation of products of the oxidation of the hydrogen and the recovery of the heat held latent by the aqueous vapor (H_2O), to obtain more than 72 per cent. of efficiency.

The report states that the flame of water gas has a temperature equivalent to 5,112° F., and that the flame of ordinary coal gas has a temperature of 2,430° F. only. The value of equal volumes of different combustible gases is more correctly given as follows:

Water gas.....	2,813 units.
Coal gas.....	5,511 "
Generator gas.....	1,470 "

In the table accompanying the report giving the units of heat of different gases it is represented that when the reactions evolving water gas are produced—27,440,000 units are contained in the gas produced from a ton of fuel—but when producer gas is used only 17,920,000 units of heat are held by the gas; now, were this latter statement correct it would prevent, on economic grounds, the application of this gas at all; assuming that 1 ton of coal has a calorific value of 32,000,000 units, if this coal is converted into a gaseous condition by semi-combustion the gas evolved possesses thermo-chemically and as sensible heat the whole of the heat possessed by the coal less that lost by radiation and convection and that absorbed by chemical reactions. In a gas producer in which air *per se* is the agent of oxidation, the nitrogen, introduced by the air, carries with it in a sensible form the heat resulting from semi-combustion or the oxidation of the carbon to CO; the heat sensibly attached to the nitrogen is not lost, and can, to a greater degree than if the heat were latent as in steam, be recovered, unless the latter or steam were condensed; but this for all ordinary arrangements of combustion is impracticable.

The report represents the heat value of ordinary coal gas per ton of fuel as equal to 6,720,000 units. If we divide this figure by the number of cubic feet of gas it represents (or 10,000), then—

$$\frac{6,720,000}{10,000} = 67.20,$$

or 67.20 equals the number of heat units of one cubic foot of ordinary coal gas; we will compare this with the other values given in the table.

The value of the water gas is given as equal to 11,760,000; this divided by 35,000 (= the number of cubic feet it represents), gives as the value of one cubic foot 33.60 units, or exactly half the thermic value of coal gas. It is only fair to add that besides the 10,000 cubic feet of gas given off in the closed retort practice, there is the residual coke, which possesses *inter se* the balance of the units, less that carried off in tar form.

In the report the absence of nitrogen in water gas is made a strong argument in its favor. This characteristic is in some applications a great advantage, but in making a comparison between the heat of combustion carried off as sensible heat by the products of combustion between ordinary producer and water gas, we should not forget that there is a considerable loss due to the heat absorbed and rendered latent by the steam resulting from the reoxidation of the hydrogen, we shall see that this loss is of considerable value, and more than balances that debited to the nitrogen in producer gas.

Taking the reaction represented by $C + H_2O = CO + H_2$ to produce water gas, and its complete combustion to be represented by $CO + H_2 + 2\,O + 8\,N = CO_2 + H_2O + 8\,N$, and acknowledging producer gas to be evolved according to the following sequence of reactions:* $2\,N_4O + C = 8\,N + CO_2$, and $8\,N + CO_2 + C = 8\,N + 2\,CO$, then the combustion would be effected as follows: $8\,N + 2\,CO + 2\,O + 4\,N = 12\,N + 2\,CO_2$.

Assuming that in each case, as an example, 12 grms. of carbon are used, and are used first to produce water gas, and afterwards the same weight is used to produce carbonic oxide, and assuming that both kinds of gas are consumed and their products of combustion are allowed to escape at a chimney temperature of 500 degrees Cent., then:

$$500\left(\underset{[12+32\times0.217]}{CO_2} + \underset{[2+16\times0.481]}{H_2O} + \underset{[112\times0.244]}{N}\right) =$$

22.767 units of sensible heat.

$18 \times 606.5 =$ 10.917 latent heat of steam.

Total, 33.684 units lost.

Now, taking the combustion of producer gas for the same weight of fuel, then—

$$500\left(\underset{[12+32\times0.217]}{CO_2} + \underset{[84\times0.244]}{N}\right) = 15.122 \text{ units lost as sensible heat.}$$

The ratio of heat units lost to the total units produced by the combustion of the two gases will then be as follows:

Water gas:

28 grms. CO to CO_2 = 67.284 units.
2 grms. H to H_2O = 57.924 units.
125.208 units.

Ratio of loss will therefore be—

$$\frac{33.684 \times 100}{125.208} = 25 \text{ per cent.}$$

Producer gas:

28 grms. CO to CO_2 = 67.284 units.

Ratio of loss will therefore be—

$$\frac{15.122 \times 100}{67.284} = 22.4 \text{ per cent.}$$

Hence we see the advantage is slightly in favor of ordinary producer gas. The real advantages possessed by water gas as a fuel in comparison with producer gas may be estimated as follows:

* For facility of calculation, N_4 is taken instead of $N_{3.6}$.

It contains in a given volume a greater calorific value, so that in its application there is a less proportion of the heat lost by radiation. Whether combustion is produced for thermodynamic or purely heating purposes, the greater the periodic rate of its production and transmission for useful effect, the less the loss by radiation; and, as I have already pointed out, the greater the piston speed of a motor, the less the heat lost by jacket or cylinder side radiation. The same law holds good in a greater degree in furnace work; here the internal chamber, having a possible heat of, say, 2,000° C., is only divided from the atmospheric air by a refractory wall, the inner side of which is at or near the combustion temperature of steel melting, and the outer side at the temperature of the atmosphere. Hence the importance of accelerating such a high temperature process as much as possible, and the more concentrated thermic character of water gas is a decided advantage, and one that I have long recognized.

Another advantage that I have always insisted on is the fact that water gas is comparatively free from sulphur compounds (*vide Engineering*, page 460, 1886); metallurgists will recognize the value of this feature.

For steam-raising processes the fact of a boiler being in a sense a calorimeter, with its combustion flues surrounded with water, reduces the loss by radiation to an insignificant degree, and the non-luminous character of the water gas and the fact just mentioned, preclude the economic application of water gas for this purpose.

But for all purposes where concentration of calorific effect is a desideratum there is an adequate *raison d'etre* for the application of water gas. I have already shown its deoxidising or reducing value, *vide Engineering*, January 15, 1886.

New England Insurance Rating of Electric Lighting and Plant Stations.

The Electric Lighting Committee, New England Insurance Exchange, have submitted the following respecting the standard risk of electric light stations, together with a schedule for the same:

A standard risk must be built of brick or stone, not over two stories high (except a wire-tower may be approved); slate, metal, gravel, or other non-combustible roof; brick, metal or plain open cornice; plain "mill construction;" stairs and elevators outside; or if inside, the former cased up and provided with self-closing doors, and the latter with self-closing hatches; boilers and chimney outside, or if in adjoining building, to be thoroughly cut off by approved fire-wall projecting through the roof, and fire-doors; occupied for no purpose except the legitimate uses of the station itself; unexposed by contiguous hazards, or if exposed, to have approved fire-walls on exposed sides.

Fire Protection.—Must have city fire department, with fire-alarm box near by; or if water works only, hydrant on not less than a four-inch pipe, with water pressure of not less than 60 pounds; must be located within 150 feet, and ample hose and nozzles owned and kept ready for use by owners of station; or if neither city fire department nor water works, must have a fire pump of approved kind and capacity, with ample hose and nozzles; must have at least one-half dozen fire pails, kept full, on each floor, or to each twenty-five hundred feet of floor space, or fraction thereof, with ample water ready for immediate use; also small hose supplied from tank or water works, the hose to be constantly attached to supply pipe inside of each room, and having nozzles without cocks.

Electrical Arrangements.—Dynamos must be set on thoroughly dry wood base frames, filled to prevent absorption of moisture.

Wires from dynamos to switch-board, and thence to outside lines, must be covered with a suitable heavy insulation, and all wires of opposite polarity not less than 1 foot apart.

(Conductors from ceiling or floor to switch-board may be run at a less distance than 12 inches from each other, but in that case an improved insulation must be provided.)

If conductors from dynamos are run under floors (except the space underneath be a perfectly dry, finished room, and not less than 6 feet between floors) they must be specially insulated, and will then be subject to approval.

All conductors must be run in plain sight, and on glass, porcelain, or hard rubber hook insulators. Cleated work will not be accepted.

All wire connections should be soldered, if necessary, to secure good contact.

High potential switch-boards must be so located that they will be accessible, and open on all sides, and entirely disconnected from all woodwork, or combustible material; also kept free from moisture. They should be as near non-combustible as possible.

Low potential switch-boards must be constructed the same as those for high potential, so far as accessibility, protection from moisture, firm connections, etc., are concerned; switches must have ample capacity and contact to carry their maximum load without heating. Bus wires or bars carrying the current of two or more dynamos, and all connections thereto, must have sufficient sectional area to prevent heating, and must be well insulated on non-combustible supports.

Feeder equalizer frames must be constructed of non-combustible material; they must be open and accessible on all sides, and supported at least one foot from wooden floors, partitions, or other woodwork; nothing should be placed around them to obstruct a free circulation of air through them; and they must be placed so as to be in plain view of the station attendants at all times.

All currents having an electromotive force of over 500 volts will be treated as high potential, or arc light currents.

Wires leaving the station must be in accordance with the rules of this "Exchange," and provided with approved lightning arresters.

Care and Attendance.—A competent man must be kept constantly in the dynamo room while the dynamos are running. Oil must not be allowed to accumulate on the floor, and all oily waste must be kept in regular metal waste cans, or removed from the station daily, after the dynamos are stopped and cleaned. Arc lamps must always be provided with perfect globes. "Exchange" rules as to safety fuses and all like devices must be observed. Rooms occupied for storage of supplies, or for repairs, must be kept in a clean and orderly manner.

Base Rate for Standard Station	75 cents.
Charges for Deficiencies as follows:	
1. Frame	10 cents.
2. Over two stories high; for 3d story (a basement will not be regarded as a story)	5 "
3. For each story above 3d	10 "
4. Shingle roof	5 "
5. Cornice (except standard) on exposed Station	5 "
6. Sheathing, lath and plaster, or any finish leaving concealed spaces, according to discretion, but not less than	15 "
7. Stairs or elevators inside (except as provided in "Standard")	10 "
8. Boilers and chimney (except as provided in "Standard") at discretion, but not less than	15 "
9. Without any of fire protection, as required in "Standard," at discretion, but not less than. (If partial "Standard," requirements as to fire protection at discretion.)	50 "
10. If fire pails and water only, not less than	40 "
Electrical Arrangements:	
11. Dynamos, unless as required by "Standard"	25 "
12. Conductors, if run under floors, except as permitted by "Standard"	25 "
13. Conductors, if concealed, at discretion, but not less than	25 "
14. Insulation, unless as required by "Standard," at discretion, but not less than	25 "
15. Switch-boards, unless as required by "Standard," at discretion, but not less than	50 "
16. Feeder equalizer boxes, unless as required by "Standard," at discretion, but not less than	50 "
17. Care and attendance, unless as required by "Standard"	25 "
18. Exposure, at discretion, but not less than	10 "
19. Other occupancy of station, at discretion, but not less than	10 "

Insurance on Dynamos must be specific, and rate to be 25 cents in excess of schedule.

JUDGE PHELPS, of the Keokuk (Iowa) District Court, has given a decision against the local Gas Company in its suit against the city. The city being desirous of making a change in the system of public lighting, notified the Gas Company that on a certain date the existing lighting contract would become null and void. The Company contested this on the ground that the city was bound by perpetual contract to use gas on its streets, unless the city should choose to purchase the gas plant and the Company's franchises—the city having the right to so elect from and after July 1, 1888. Judge Phelps dismissed the complaint on the ground that city ordinance No. 116, which sets forth the provisions of the contract, was valid and binding up to July, 1888, having been made to cover a period of 20 years, and that the same is no longer effective so far as the public lighting is concerned.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE retirement of Mr. W. W. Greenough from the Treasurership of the Boston Gas Light Company was emphasized by the recent presentation to him of a most eloquently worded address of respect and affection from those who served under him for so many years. The address proper is a marvel of penmanship admirably enshrined in a portfolio that is a model of the binder's art.

THE plant and franchises of the Sheboygan (Wis.) National Gas Company have been purchased by Philadelphia capitalists—possibly the United Gas Improvement Company—who, it is said, will make important extensions.

THE completion of the huge tank (150 ft. diameter by 45 ft. in depth) for the one and one-half million cubic feet content gasholder of the Louisville Gas Company was formally made something over a week ago. The "last brick" was bedded in the presence of the executive management of the Company, some of whom we imagine now have a clearer idea of such constructions than they ever had before. We might also say, in connection with this auspicious termination of a work so inauspiciously begun (the contractor who started the tank having speedily abandoned the same because of the difficulties encountered in the operation of sinking), that Engineer Barret believes in beginning early to "train the young idea;" for it was his son, "aged seven," who "laid the last brick."

MR. TABER has applied for permission to supply electric light in Fairhaven, Mass., from the electric annex of the New Bedford gas works. The Fairhaven Electric Light Company, we believe, never got beyond the charter stage; and as the people want electric lights, there seems to be no valid reason why Mr. Taber's Company should not take advantage of that desire.

IT is reported that important changes are to be made in the manufacturing plant of the Winsted (Conn.) Gas Light Company; one authority having it that a water gas system will be introduced.

MR. FRED. BREDEL'S draughtsman has been ordered to design a moving carriage of the upholstered perambulator type. Mrs. B. is "doing quite well; thank you!"

THE dates on which occurred the maximum and minimum (respectively) sendout of 20 of the largest gas companies of Massachusetts during the year ended June 30, 1888, are appended:

Company.	Maximum.	Minimum.
Boston	Dec. 21.	July 24.
Lowell	Nov. 25.	June 17.
Roxbury	Dec. 23.	July 3.
Cambridge	Dec. 21.	July 21.
Worcester	Dec. 15.	June 17.
Lawrence	Dec. 5.	May 22.
Springfield	Dec. 16.	July 4.
Charlestown	Dec. 24.	July 13.
Fall River	Dec. 15.	June 17.
Lynn	Dec. 21.	July 31.
South Boston	Dec. 24.	July 24.
Holyoke	Nov. 5.	July 2.
Dorchester	Dec. 29.	July 7.
Haverhill	Dec. 15.	May 6.
Brookline	Dec. 21.	July 7.
New Bedford	Dec. 24.	July 4.
Taunton	Nov. 25.	June 20.
Salem	Dec. 17.	July 4.
Newton	Jan. 20.	July 2.
Waltham	Nov. 25.	July 4.

THE works of the Brunswick (Me.) Gas Light Company have been leased to the United Gas Light and Fuel Company, of Gardiner, for a term of 25 years from the 1st inst. The lessees will carry out a plan of betterments. They are now also operating the gas works at Quincy and Gardner, Mass., and at Bath, Me.

THE cheese-paring policy is the natural result of the change in ownership of the Boston Company; which will be appreciated when it is said that already the "rearrangement of the salary list" has resulted in a saving of something in excess of $25,000 per annum. The inference naturally would be that the old Boston management had been profuse, if not profligate, in salaries expenditure; but those who were conversant with the Greenough regime will acquiesce in the remark that the senior Greenough believed in paying only what an employee's services were worth—the real value of the same to the Company being the standard. Fairness is never to be confounded with lavishness.

ON the other hand, something had to be cut down or rearranged in order that the new common stock holders might bring their mathematics (together with a telescope) into play in an attempt to figure out the amount and disclose the probable day when a dividend might be their portion. This shadowy idea had birth in a statement, recently published by Kiernan, of this city, to the effect that the Boston Stock Exchange had added to its unlisted schedule the following securities: Bay State Gas Company—collateral trust 5's, $7,000,000; second mortgage 5's, $3,000,000; 7 per cent income bonds, $2,000,000; stock, $5,000,000. A fairly good load, that. Let us see; the "rearrangement economies" amount so far to $25,000; one per cent. on $17,000,000 is $170,000; therefore, $25,000 is—well, it is, of course, a very fair per cent. on the one per cent. of the capital.

AN employe of the Northern Pacific Railway—his name is Harrison, and he is located in Ashland, Wis.—is said to have perfected an electrical contrivance which causes the ringing of a bell in the office of any hotel when one of its inmates has blown out the gas. This affords a notable example of how electricity can be of real assistance to a hotelkeeper, if not to a gas maker.

AT the annual meeting of the Mount Holly (N. J.) Gas Light Company Messrs. John S. Irick, W. Budd Deacon, John Semple, Henry C. Risdon, Chas. W. Brown and W. J. Irick were elected a Board of Directors. At the organization meeting the following officers were chosen: President, W. B. Deacon; Secretary and Treasurer, H. C. Risdon.

THE ordinance of the Mutual Gas and Fuel Company, which proposes to supply gas to Hyde Park (a Chicago suburb) at the rate of 60 cents per 1,000 cubic feet, has been progressed by the Trustees.

THE Troy *Daily Press* prints the following in relation to the purchase of the Troy Gas Light Company: "A monopoly of the gas business of this city has at last been effected. For a long time negotiations with that object in view have been going on, and the sagacious foresaw that the culmination of the scheme was near at hand. The start was made when the plant of the fuel gas company was purchased, and not long afterwards the control of the Citizens Gas Light Company passed into the same hands. The last to be swallowed up is the Troy Gas Light Company. The capitalists holding a majority of the stock in the Troy Gas Light Company have agreed to sell. The price offered for the stock was $125. Before the last dividend was declared a large offer was made contingent also with reference to certain indebtedness of the Company. The purchasers in the three cases were A. N. Brady, of Albany, and E. C. Benedict, of New York. The former is a native of this city, and from a poor boy worked his way up until he is a very rich man. He is largely interested in gas companies. Mr. Benedict is a banker. Cash will be paid for the stock of the Troy Gas Light Company, as was the case with the other companies. As soon as the transfer is made the necessary steps will be taken for the organization of one company to transact the business that was formerly done by the three. Gas will be furnished both for heating and illuminating purposes, and it has been promised that there will be a considerable reduction from the prices that are charged at present. The Troy Gas Light Company was organized in March, 1848. Daniel Southwick was the first President, and the original Directors were Jonas S. Heartt, Charles Dauchy, Jno. A. Griswold, E. Thompson Gale, John T. McCoun, T. W. Lockwood, George B. Warren and Lemuel Davis. Of these persons Mr. Lockwood is the only survivor. The Common Council, in granting the charter of the Company, exempted the personal property from taxation for three years, and also agreed to grant no other company a franchise for 12 years. A large share of the original stock, which was $100,000, was held by Philadelphia parties. Subsequently the stock was increased to $200,000, and again to $300,000, the amount which it is at present. The office of the Company was for many years at the store of Southard, Cannon & Warren, on River street, where the office of the Troy and Lansingburg Railroad is now. The works of the Company have always been on Hill street. They have been rebuilt several times, and once were badly damaged by fire. The present officers of the Company are: President, T. W. Lockwood; Secretary and Treasurer, Townsend V. Church; Directors, W. P. Warren, E. C. Gale, J. M. Warren, S. M. Vail, W. H. Doughty,

H. C. Lockwood, W. A. Thompson and C. W. Tillinghast. F. A. Sabbaton has been the Superintendent for 25 years." Since this article was printed the transfer has been effected, and while the nominal rate paid was $125 per share, certain other concessions cause the actual price to be close to $160 per share. Beyond a doubt the property, even at the latter figure, is a bargain for its purchasers.

Gas Inspector Gilbert, of Omaha, Neb., has been freely referred to by certain agents for a patented gas governor, now conducting their operations in Nebraska, as vouching for the superior merit of their article. We hardly need to say, to make the contrary plain, that the Inspector has been misrepresented. In fact, he does say that the particular governor is of no value whatever.

Among the contracts recently awarded by Director Wagner, of the Philadelphia Municipal Gas Works, we note the following: To Fred. Bredel, new benches for the Ninth Ward station; Camden Iron Works, 30-inch main pipe, at $3.42 per foot.

At the 29th annual meeting of the Chuctanunda (Amsterdam, N. Y.) Gas Light Company—held last Monday—no change was made in the management.

At the annual meeting of the Municipal Gas Company, Rochester, N.Y., the following officers were chosen: President and Treasurer, Wm. Runkle; Secretary, W. S. Cole; Directors, Wm. Runkle, Edward Tuck, Daniel Runkle, Wm. Steiger, and M. W. Cooke.

The annual meeting of the stockholders of the Columbus (Ohio) Gas Light and Coke Company is to take place this afternoon. There are nine members in the directorate of this Company. Among other things that may come before the meeting will be the new works project.

The New Bedford (Mass.) Gas Light Company is paying its regular quarterly dividend of 2 per cent. Checks for it bear date of April 15.

The attempt to levy and collect back taxes on stocks of manufacturing corporations, now in progress at Nashville, Tenn., is making plenty of work for the local courts. Among those interested is the Nashville Gas Light Company, whose proprietors obtained an injunction (12th inst.) against H. B. Morrow, County Trustee, from assessing their shares. The bill says that the Company manufactures its gas exclusively from coal mined in Tennessee, and is therefore exempt from the tax sought to be imposed upon corporations that work upon materials imported into the State, and that it can only be called upon to pay taxes in a manner similar to that directed for individuals. For the year 1888 the Company is assessed upon a valuation of $678,160, and in addition it is also assessed upon $835,240, the value of the shares in the hands of the proprietors. The Company claims that the minor sum embraces the franchise and every species of property and rights possessed or used by it; that it is accordingly not for any other or further assessment for taxation, and that the attempt on the part of the authorities to assess the capital stock is void because unauthorized by law. The Company's assessment for 1887 was paid under the Act of 1885, and it is then alleged that the current assessment should be levied under the same Act instead of the one of 1887. The tax amount involved is $4,200.

The Williamstown (Mass.) Electric Light Company insists that under its franchise it has the right to establish a gas plant. Nothing would have been heard about this if those interested in the gas works now being constructed had purchased the "rights" from their speculatively inclined holders.

At the adjourned annual meeting (at which it was decided to increase the capital stock to $3,000,000) of the Thomson-Houston Company the following Directors were chosen: H. A. Pevear, J. N. Smith, D. F. Spinney, S. A. Barton, C. H. Newhall, Elihu Thomson and C. A. Coffin.

The Worcester (Mass.) Gas Company had a fortunate escape the other night. About 9.30 P. M. of the 9th inst., the fire alarm signal brought the local fire laddies to the works of the gas company, where it was found that the lime sheds were blazing fiercely. The purifying room not being a great distance away, with a sharp wind directing the flames towards it, the firemen exerted themselves bravely and well in an effort to prevent an explosion. They were eventually successful. The loss was less than $500.

The large Hoe press on which the New Britain (Conn.) *Herald* is printed is operated by an Otto gas engine.

In connection with our prior intimation that the New Britain Gas Light Company would reduce its selling rate on or about the 1st of this month, we have to explain that our prophecy remains unverified, so far. We hope, however, to soon say the contrary.

President Belknap, of the Duluth (Minn.) Gas and Water Company, has good cause for complaint over the antics of the local authority. Something less than a fortnight ago he appeared before the Council, in company with Vice-President Cary and Secretary Squires, and gave the City Fathers some pretty hard facts to digest. Among other points he explained that it was due to the action of the Council in securing a temporary injunction to restrain the Company from furnishing water to Superior (a town in Wisconsin but 9 miles distant from Duluth) that the Company was unable to float its bonds, with the proceeds from which sale it was intended to build a new gas plant, and a new high-service reservoir; and that the loss to the Company by this injunction had so far been not less than $50,000. [The objection by the Duluth authorities to the extension of the service to Superior was that the water supply of the former would be endangered by such drain; but the flimsiness of this protest is shown in the fact that Duluth's maximum demand is but up to 60 per cent. of the Company's actual present supply ability.] Mr. Belknap, therefore, asked the Council to withdraw its injunction, that the Superior contract could be complied with, and the Company thus enabled to carry out its proposed plan of betterments on its Duluth water and gas plants. There is no doubt that the Council will acquiesce in this reasonable demand.

At a special meeting of the Stamford (Conn.) Gas Light Company, held on the 13th inst., it was resolved to accept the amendment to the charter, granted by the Legislature, authorizing the Company to increase its stock and to issue bonds. In all probability these increases are to provide for the operation of an electric lighting plant, and the virtual rebuilding of the gas works, which are entirely inadequate to meet the ever-increasing demands made upon their resources.

The Adams (Mass.) Gas Light Company has petitioned the Gas Commissioners for a change in its charter to allow the Company to engage in the supply of electrical currents for light and power. As local sentiment is all in favor of the scheme, there is no doubt that the necessary consent will be granted. The Company intends to use a gas engine for driving the dynamos.

The Atlanta (Ga.) *Constitution*, of April 15, prints the following: "On Saturday night a majority of the stock of the Atlanta Gas Company was sold to the United Gas Improvement Company, of Philadelphia. The negotiations were conducted by R. J. Lowery, J. H. Porter, and J. H. Mecaslin, for the Atlanta Company, and Mr. W. W. Gibbs and associates for the Philadelphians. The price paid is $31.25 per share of $25, par. It is further agreed that every shareholder in the Atlanta Gas Company can put his stock at these figures and the Philadelphians are bound to take it. A forfeit is deposited to guarantee this, and the Directors have set a commendable example in thus protecting the minority shareholders. The Atlanta Gas Company was organized in 1854, and the city was first lit by gas on Christmas night of that year. The capital stock was $50,000. The business paid handsomely from the start, and it not only paid dividends without fail, but has added to the plant from the profits until the capital stock rose to $416,000. It is now sold at $31.25 per share, or about 30 per cent. above par. The price is even better than this, for the Company has over $30,000 in its treasury which it retains for division among its stockholders. Thus the real price per share is about $36. No stockolder is compelled to sell, but the purchasers are bound to take all that is offered before July 1st. The largest stockholder was Mr. Helme, of Philadelphia, who gets $160,000 by this trade; Mr. J. A. Porter, who is next, gets $60,000; Major Mecaslin's share is about $40,000; Mr. R. J. Lowery, $30,000; T. G. Healy, Mrs. Duncan, R. Hill, G. Hope, and others hold smaller amounts. The Atlanta Home Insurance Company bought some of the stock, for which it paid $10,000, and drew from its investment and dividends just $19,500. The city of Atlanta was one of the original investors, having put in $20,000. Of this it paid $10,000 to Messrs. Patterson and Morrill as brokerage on an issue of 7 per cent. bonds; the other $10,000 it sold about two years ago for $100,000. If the city had held the stock until the trade was completed it would have received about $200,000. It is estimated that in 33 years the city has drawn over $300,000 on its investment. The purchasing Company owns the gas works in a number of towns and cities. It is extending its operations rapidly. Some months ago it bought the other gas works in Atlanta, and its purchase on Saturday gives it control of the gas supply of Atlanta. It will immediately

move to enlarge the works and lay several miles of new pipes. The consumption of gas in Atlanta is steadily increasing. Last year the Atlanta Gas Company sold 80 millions cubic feet of gas, and the water gas company sold 35 millions. The combined output will probably reach 125 millions for the current year. It is said to be improbable that the price of gas will be raised, though it may be put at $1.25 per thousand. Possession is to be given at once." This sale ends one of the most protracted gas wars on record.

THE following are the terms of the proposed ordinance (it was rejected by Councils) asked for by the parties named, for the right to manufacture and supply fuel gas in Minneapolis, Minn.:

Sec. I.—That W. A. Doney, W. P. Palmer, and J. K. Doolittle, their successors and assigns, be and are hereby permitted and authorized to manufacture, sell, and distribute gaseous fuel in Minneapolis, and to lay all necessary pipes and mains in and through any of the streets, alleys, or public places of the city for the purpose of delivering and distributing the same to consumers, etc.

Sec. II.—The exercise of the principle herein granted shall be upon and subject to the following considerations, conditions, and limitations: 1st. That pipes and mains shall be laid under the surface of such streets, etc., at such depth as shall be necessary to protect the same, and shall conform to the grades established thereon. Should the grade of any street be lowered, the owners of such pipes and mains shall lower the same at their own expense and cost. [Then follow clauses 2, 3, 4, 5, and 6, which refer solely to the conditions under which the pipes shall be maintained, how repairs to streets shall be made, and so on.]

Sec. III.—The privileges and powers granted in this ordinance shall expire by limitation in two years from its passage, unless prior to that time the construction of the said buildings, plant, and machinery shall be begun and carried to completion, and at least 3 miles of pipes and mains shall be laid. Provided, however, that in computing the time herein no portion thereof during which said construction is prevented or delayed by legal injunction, or restraining order of court, shall be included. Provided, further, that no opening or excavation shall be made for the purpose of laying such pipes or mains, until said persons or their successors shall have executed to said city a good and sufficient bond in the sum of $10,000, conditional that the whole of said 3 miles shall be laid within the time aforesaid, should such bond be required.

Sec. IV.—The net price to be charged for said gaseous fuel or fuel gas shall not exceed 60 cents per 1,000 cubic feet of gas furnished, except that should unforeseen circumstances arise, whereby the owners and operators of said plant shall be unable to furnish said fuel gas at the said price without loss, the price thereof may be increased by and with the consent of the City Council, but not otherwise. It is further provided, however, that the price of said fuel gas to the city of Minneapolis for heating its public buildings shall be 10 per cent. less than the price charged to general customers for the same quantity of fuel gas used.

Sec. V.—After the expiration of three years from the passage of this ordinance, the said operators and owners shall be prepared and may be required to furnish said gaseous fuel within a reasonable time after demand thereof, and the payment or tender of the regular price therefor, to any and all buildings of the city of Minneapolis and of private consumers along the line of their said mains which are properly prepared to receive the same.

Sec. VI.—At any time after four years from the passage of this ordinance, said operators or owners may be required to extend their pipes and mains to any portion of the city of Minneapolis and furnish the said gaseous fuel to all buildings along the lines thereof, as provided in the preceding section. Provided, however, that reasonable time shall be allowed for such extension, and said operators or owners shall receive good and sufficient guarantees of a profit of 7 per cent. per annum for 5 years upon the investment necessary to make such extension before the same can be required of them.

Sec. VII.—The persons before mentioned, their successors and assigns, in case of their acceptance of this franchise, shall be entitled to the exclusive enjoyment of all the privileges hereby granted and confirmed for the period of 20 years from and after the passage of this ordinance.

Sec. VIII.—After the expiration of 10 years from the passage of this ordinance, the city of Minneapolis shall be entitled to receive annually from the owners of said franchise a sum equal to 20 per cent. of the net profits of said business and works for each calendar year, over and above all taxes, expenses and interest charges, and a 10 per cent. dividend to said owners; which sum shall be paid to the Treasurer of the city, etc. Provided, however, that the owners of said franchise shall at all times have the right to reduce the price of said gaseous fuel to consumers, and the said city shall have no right at any time to object or to prevent such reduction, or the expenditure of a reasonable sum for repairs and betterments.

Sec. IX.—The city of Minneapolis may at its election purchase said works, machinery, fixtures, pipes, franchise, etc., at the end of said 20 years, or at the end of each period of 10 years thereafter, at the actual value thereof. Said value shall be fixed by three arbitrators, whose award shall be the price at which said franchise, etc., may be so purchased, and said city shall give notice of its election to purchase, and the price shall be fixed at least six months prior to the expiration of said 20 years, or of each successive period of 10 years thereafter, and upon failure to give such notice and have such period fixed, the privilege hereby granted shall be continued, etc.

The remaining sections, X., XI. and XII., provide for the acceptance by the incorporators of the ordinance, and the time for its going into effect, etc.

THE building on 511 Olive street, occupied for years by the St. Louis Gas Light Company as office headquarters, has been sold to Mr. J. F. Chapman, who paid $75,000 for it. One of the conditions of the transfer is that the Company may remain in occupancy until other suitable premises are secured.

THE capital stock of the Dorchester (Mass.) Gas Light Company has been purchased by the Bay State syndicate. The price paid was $125 per share. As we understand it, the entire capital stock ($400,000) was secured.

A SURPRISING bit of information from Joliet, Ills., is to the effect that a franchise for another gas works at that place has been granted to Michael Moran and associates. The Company is capitalized in $35,000, and the maximum rate at which gas may be sold is put at $1.80 per 1,000 cubic feet. Supt. Moran (he is also a City Father of Joliet) had been with the Joliet Gas Company—and an efficient and faithful officer he was, too—for over 30 years.

THE Directors of the Consolidated Gas Company of Baltimore (Md.) have approved recommendation of the Finance Committee for the general mortgage issue of seven million dollars to take up the outstanding 6 per cent. loans, the balance to improve the property of the Company. The new loan is to live for 50 years, and is to bear 5 per cent. They will date from July 1, 1889, the first coupon coming due on Jan. 1, 1890. This ought to be a good bond for investors.

ARTICLES incorporating the National Heat and Power Company were filed in Camden, N. J., on April 15th, by Messrs. W. B. Spittall, G. W. Cadwell and G. Jaeckel. It is capitalized in $5,000,000, with $5,000 paid in.

A DESPATCH from Sedalia (Mo.) dated April 10, says: "James Green, of St. Louis, acting for the local Gas Company, took formal possession to-day of the Sedalia Electric Light works, and will immediately begin the erection of a fire proof building. The plant will be largely increased. The Topeka (Kas.) Company, which was awarded the contract for lighting the city at the last meeting of the Council, has so far failed to file the $10,000 bond required—only one day remains wherein the act may be accomplished legally—and it looks as though the contract would be negatived. In this event Mr. Green will make a lively struggle to receive a portion of the city's public lighting.

THE business of the New York city gas companies is increasing at an amazing rate.

Recent Patent Issues.

The following list of recent patents relating to the gas interests is specially reported by Franklin H. Hough, solicitor of American and foreign patents, 925 F street, N. W., Washington, D. C.

ISSUE OF APRIL 2, 1889.

400,602. Gas or Vapor Burner for Heating. O. Rotton, Brooklyn, N.Y.
400,458. Gas Engine. A. Histon, Yonkers, N. Y.
400,658. Electric Lamp Attachment for Gas Fixtures. E. F. Gennert, Brooklyn, N. Y.
400,827. Gas Furnace. R. Cartwright, Rochester, N. Y.
400,479. Electric Gas Lighter. J. Y. Parke, Phila., Pa.
400,492. Electric Gas Lighting Device. D. Rosseau, New York, N. Y.
400,671. Gasometer. W. B. Hammond, Boston, Mass.
400,532. Service Pipe Connection for Gas Mains. G. Westinghouse, Jr., Pittsburgh, Pa.
400,683. Forming Gas Outlets. W. M. Jackson, New York, N. Y.

ISSUE OF APRIL 9, 1889.

400,184. Apparatus for Lighting Gas Burners. A. A. Lister, Camberwell, Surrey, England.
401,204. Igniting Apparatus for Gas Engines. L. C. and B. Parker, Kansas City, Mo.
401,153. Electric Gas Lighting Burner. J. Geary, Phila., Pa.
401,048. Gas Pressure Regulator. W. H. Metcalf, New Haven, Conn.

The Market for Gas Securities.

Consolidated maintained the advance of last week, the closing bid price on Thursday (to-day is a holiday on the Exchange) having been 88⅝, or the identical bid price of our report of a week ago. It did sell up to within a close fraction of 90, but realizing sales caused the advance. It is cheap at ruling figures. Mutual shows a steadily hardening tendency, some genuine transactions having taken place at 102½, with that figure bid for another lot. Equitable is strong, and we think these shares are a purchase at anything under 122. In Brooklyn shares we have only a nominal market, although Nassau is held for a better figure than 111¾. Signs are not wantng that consolidation or more or less perfect amalgamation is on the cards in the case of Brooklyn's gas supply. The present seven-sided agreement will cease with the day named in the contracts, and beyond reasonable doubt the companies will so arrange it that three plants (possibly four) shall attend to the business now performed by seven. In this event why are not the low priced gas stocks good investments at current rates?

The Troy (N. Y.) bargain is virtually made. The purchasers will take all stock offered them to June 1 at the $125 figure. The cash surplus goes to holders of record, and this virtually amounts to parting with the stock at 160 to 165. The Rochester (N. Y.) sale, while not yet accomplished, might as well be taken as an accomplished fact. On high authority, the reported sale at Cleveland, Ohio, is declared in every sense a canard; although there can be no reasonable doubt that some pretty fair ground for the original rumor was dug up. We are glad that the sale is not of record, anyhow. The general market is strong.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 Wall St., New York City.

April 22.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share. ☜

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	88½	—
Central	500,000	50	—	—
" Scrip	220,000	—	47	57
Equitable	4,000,000	100	115	117
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	116	118
Mutual	3,500,000	100	102	103
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern	125,000	50	30	—
" Scrip	108,000			
Yonkers		50	90	100
Richmond Co., S. I.	346,000	50	55	60
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	—	104
Citizens	1,200,000	20	60	70
" S. F. Bonds	320,000	1000	—	103
Fulton Municipal	3,000,000	100	123	125
" Bonds	30 [illegible] 0		-	1 [illegible]
Peoples	1,000,000	10	71	73
" Bonds (5's)	368,000	—	97	—
" " (6's)	94,000	—	100	—
Metropolitan	1,000,000	100	88	90
Nassau	1,000,000	25	111	113
" Ctfs	700,000	1000	100	103
Williamsburgh	1,000,000	50	119	122
" Bonds	1,000,000	—	109	112

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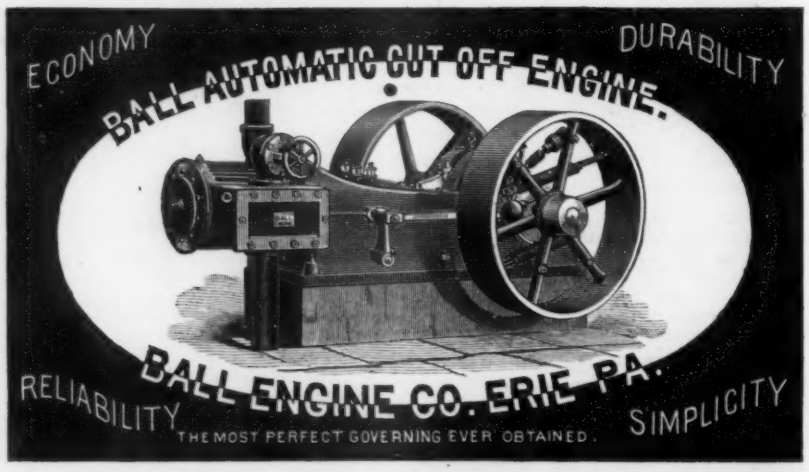

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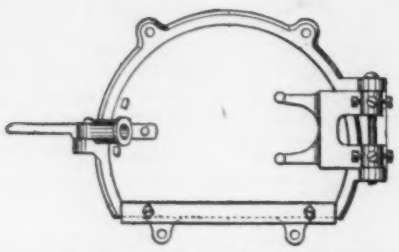

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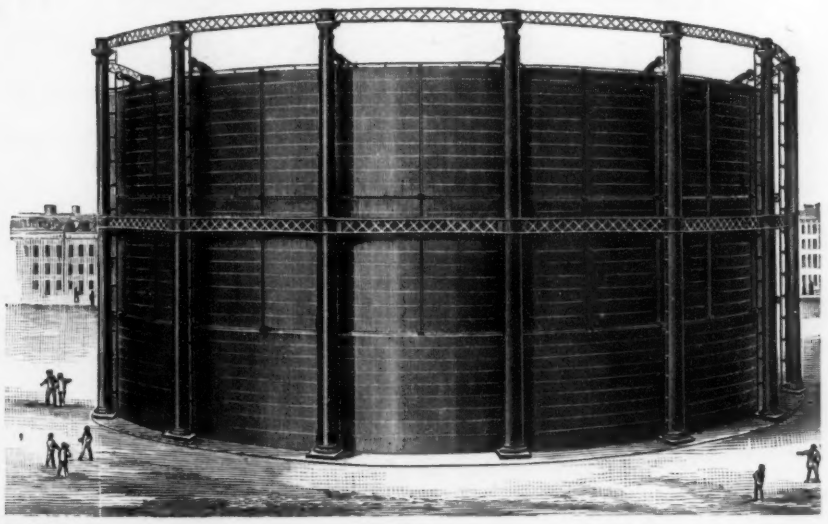

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Amsterdam	1,500,000
"	1,500,000
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Animal Charcoal Co	200,000
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Buxton	250,000
Bradford	1,000,000
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"	1,250,000
"	1,250,000
"	1,000,000
"	1,000,000
"	3,000,000
Bremen	150,000
Baltimore, U.S.A.	1,000,000
"	1,000,000
"	1,000,000
Balmain, N.S.W	125,000
Bishops Stortford	150,000
Blackpool	400,000
Brussels	1,250,000
"	1,250,000
"	750,000
"	1,250,000
Banbury	250,000
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" "	1,000,000
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Halstead	150,000
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Hastings	1,500,000
Huddersfield	300,000
"	750,000
"	1,500,000
Hof	200,000
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King's Lynn	300,000

LONDON:—

The Gaslight and Coke Co.:	
Beckton	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
"	2,500,000
"	2,500,000
Silvertown	1,000,000
Bromley	2,000,000
"	1,500,000
"	1,500,000
"	1,500,000
"	2,000,000
"	1,500,000

LONDON—*Continued.*	Capacity. Cubic feet per day.
Shoreditch	2,500,000
Pancras	1,500,000
"	1,500,000
Pimlico	2,000,000
Nine Elms	3,000,000
"	3,000,000
South Metropolitan Co:—	
Greenwich	3,000,000
Woolwich	400,000
Vauxhall	3,000,000
"	3,000,000
Lea Bridge	300,000
West Ham	1,500,000
Leeds	2,000,000
"	3,000,000
"	3,000,000
"	3,000,000
"	3,000,000
"	2,000,000
Leominster	150,000
Leiden	560,000
"	600,000
Liverpool	2,000,000
"	2,000,000
"	2,000,000
"	2,000,000
"	2,000,000
"	3,000,000
Lincoln	1,000,000
"	600,000
Lowell, U. S. A.	1,000,000
Louisville "	1,500,000
Long Eaton	500,000
Lilie	900,000
"	450,000
"	750,000
"	250,000
"	250,000
Luckenwalde	330,000
Liegwitz	300,000
Lincoln, U. S. A.	250,000
Lawrence "	500,000
Lynn "	300,000
Lyons	1,500,000
Maidstone	1,000,000
Marseilles	1,500,000
"	1,500,000
Mons	500,000
Malines	250,000
Melbourne	1,500,000
"	1,500,000
"	1,500,000
"	1,500,000
"	1,500,000
Manchester	2,500,000
Middleton	400,000
Manley, N. S. W.	100,000
Minneapolis, U. S. A.	750,000
Magdeburg	300,000
Memphis, U. S. A	750,000
Nottingham	1,250,000
"	2,500,000
"	2,500,000
"	2,000,000
"	1,500,000
"	2,000,000
Newport, U.S.A.	430,000
Newmarket	150,000
Newark, U.S.A.	680,000
Northfleet	200,000
New York, U.S.A.	2,000,000
Nice	600,000
Newcastle, N. S. W.	200,000
Numea, "	100,000
Namur	250,000
Newark	350,000
Oldbury	500,000
Otley	200,000
Oswestry	250,000

	Capacity. Cubic feet per day.
Ober Schlesian	1,500,000
Otto & Co.'s Coke Works	1,500,000
Plymouth	2,000,000
Parramatta, N. S. W.	100,000
Prescott	150,000
Providence, U.S.A.	750,000
"	750,000
Plauen	300,000
"	300,000
Portsmouth	2,500,000
"	2,500,000
Pittsburgh, U.S.A.	1,500,000
Portland, "	560,000
Pawtucket, "	500,000
Quebec	250,000
Radcliffe	750,000
Rouen	250,000
Ramsgate	1,000,000
Reigate	200,000
Richmond, U.S.A.	250,000
Roxbury, "	500,000
Runcorn Soap Co.	20,000
Rockhampton, N. S. W.	125,000
Richmond	1,500,000
Reading	2,000,000
Reichenbach	200,000
Salford	1,750,000
"	1,750,000
"	1,750,000
Smethwick	750,000
Sydney, N. S. W.	1,000,000
"	1,000,000
"	2,500,000
"	50,000
"	50,000
Sunderland	1,500,000
St. Josephs, U.S.A.	250,000
Spa	100,000
Sevenoaks	300,000
St. Petersburg	2,000,000
"	1,500,000
St. Louis, U.S.A.	2,000,000
"	2,000,000
"	1,000,000
Laclede	1,000,000
Silesian Coal Co.	600,000
San Francisco, U.S.A.	2,000,000
"	2,000,000
Sheepbridge Coal Co.	40,000
Stettin	200,000
Singapore	300,000
Sutton	500,000
Tonbridge	150,000
Tipton	400,000
Tottenham	1,000,000
Toledo, U.S.A.	750,000
Toronto	1,000,000
Uxbridge	300,000
Valparaiso	500,000
West Bromwich	1,000,000
Willenhall	250,000
Weston-super-Mare	500,000
Waltham	150,000
Wormwood Scrubs	300,000
Williamsburg, U.S.A.	600,000
"	600,000
Wellington	150,000
Warwick	300,000
Wheeling, U.S.A.	500,000
Walker	300,000
Westgate	100,000
Wilmington, U.S.A.	500,000
Windsor, N. S. W.	100,000
Wolverton	100,000
Wellington, N. Z.	250,000
Whitchurch	175,000
Washington, U.S.A.	2,000,000
Wallasey	750,000
Weimar	150,000
Wurzen	200,000
Worcester, U.S.A.	750,000
Yeadon	500,000
Yeovil	250,000

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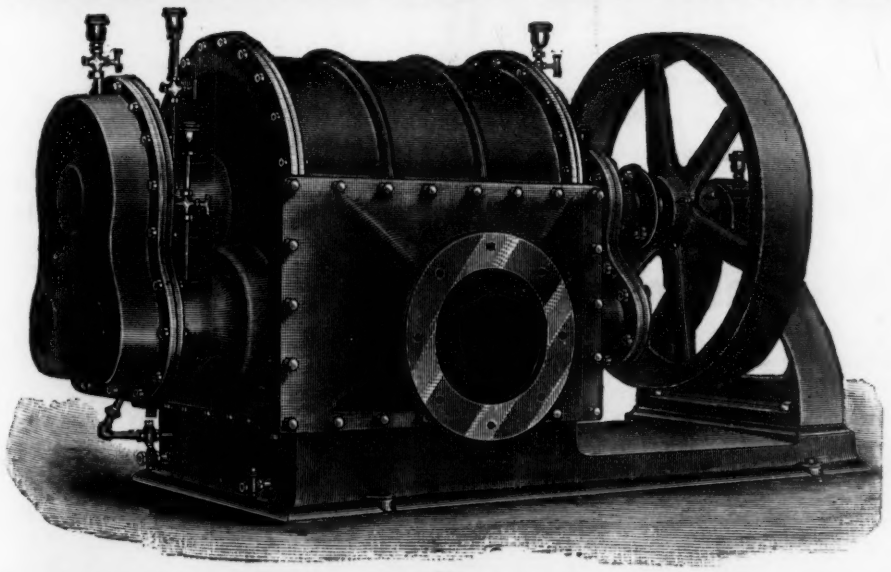

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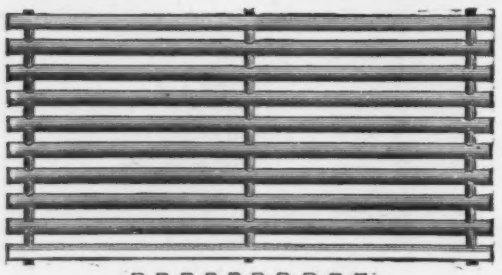

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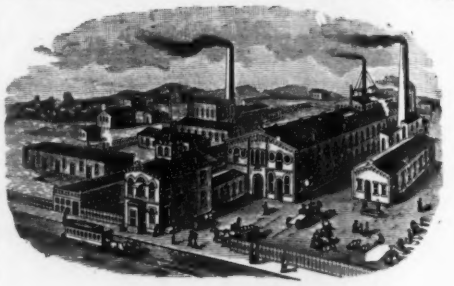

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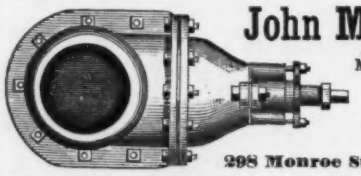

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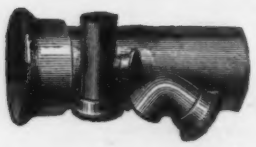

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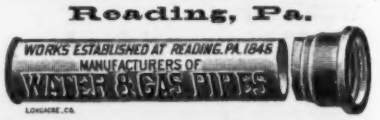

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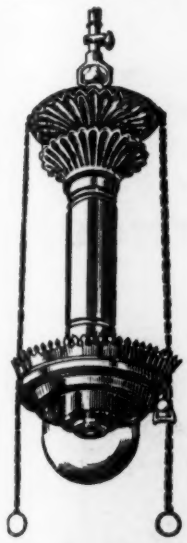

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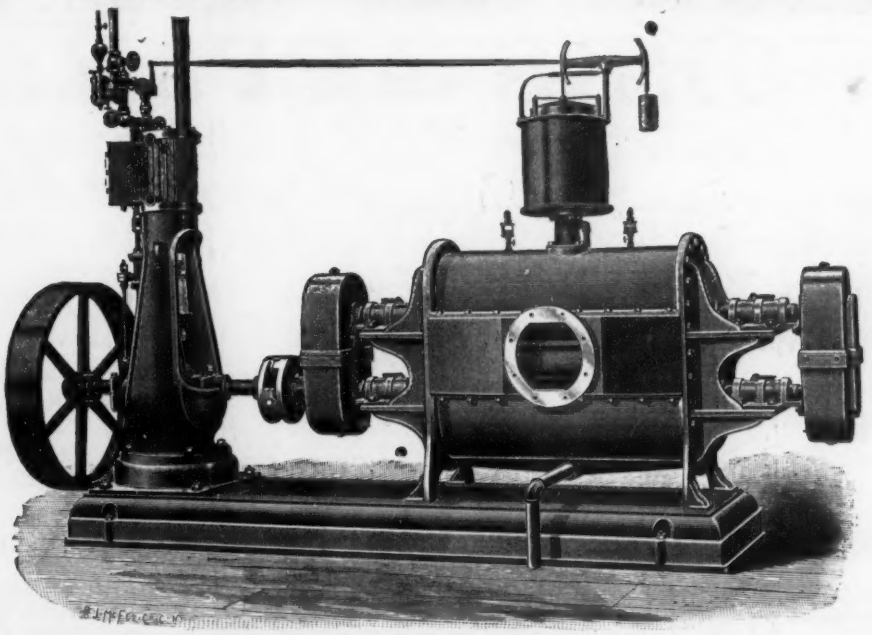

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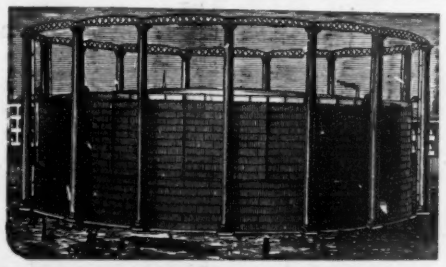

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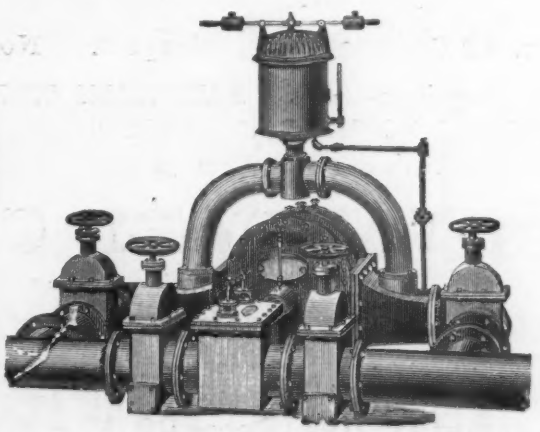

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In Theory the Otto Gas Engine realizes 18 per cent. actual work out of number of heat units in fuel consumed, while the ordinary steam plants reach but 12 per cent. **In Practice** a comparison of cost in dollars and cents between gas and steam power stands as follows (the figures below being taken from actual experience):

50-H.P. STEAM ENGINE AND BOILER, Running a Plant of Fifty 2000-C.P. Arc Lamps 12 Hours.	
4,500 lbs. Indiana nut and slack, at $1.30 per ton	$2 93
Engineer, one night, at $50 per month	1 67
Trimmer, one day, at $40 per month	1 33
Superintendent or Electrician, one day, at $50 per month	1 66
Waste, etc., one day, at $20 per year	05
Water rent, one day, at $40 per year	11
Wheeling coal and removing ashes, at $4 per week	58
100 pairs carbons, at $18.50 per 1000	1 85
One pint cylinder oil, at 60 cents per gallon	07
One quart engine and dynamo oil, at 50 cents per gallon	13
Total	$10 38

50-H.P. OTTO GAS ENGINE, Running a Plant of Fifty 2000 C.P. Arc Lamps 12 Hours.	
9,200 cu. ft. gas, at 42 cts. per M. (for cost of gas see items below)	$3 86
Engineer not needed; engine is in care of Electrician or Supt.	....
Trimmer, one day, at $40 per month	1 33
Superintendent or electrician, one day, at $50 per month	1 66
Waste, etc., one day, at $20 per year	05
Water rent dispensed with (cooling water used over and over)	....
Handling of coal included in cost of gas	....
100 pairs carbons, at $18.50 per 1,000	1 85
One pint cylinder oil, at 60 cents per gallon	07
One quart engine and dynamo oil, at 50 cents per gallon	13
Total	$8 95

Expenses of depreciation, repairs, and interest omitted, being considered the same in both cases—though depreciation and repairs are much higher with steam on account of boiler and its appurtenances. Cost of gas in the holder we estimate for most of the Middle and Western States as follows: Coal, 30 cts.; labor, 20 cts.; purification, 2 cts.; total, 52 cts. Less coke, 7 cts., and tar, 3 cts.; leaving net cost of gas 42 cts. The items of Superintendence and repairs, being paid for by the gas sold to consumers, need not be charged on extra output for gas engine consumption. Where the cost of gas is higher than here figured, coal for steam use will be found proportionally higher, and final figures of comparison show same amount of saving.

Excess in Cost of Steam over Gas Power is thus $1.43, or nearly 16 per cent.

Coal for getting up steam and banking fires is not included in above figures, and should be added, thus increasing rate of economy of gas power beyond that shown by our figures.

Where Gas Companies adopt Gas Power for Electric Plants, Water Works, Sewerage, etc., they not only choose **the most economical power for their use,** but secure to themselves the **numerous advantages of increased production,** without increase of expense, and benefit thereby their entire manufacture. They induce consumers, by their example, to abandon Steam for Gas Power, and, by establishing special rates, make

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